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UNIVERSITY OF ALBERTA

Pragmatic Language Dysfunction in Autism:

Referential Communication and Perspective Taking in Autistic Speakers

BY

Joanne Volden

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

IN

Special Education

Department of Educational Psychology

Edmonton, Alberta

Fall, 1991

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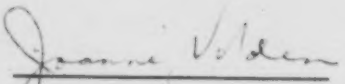

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UNIVERSITY OF ALBERTA

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Pragmatic Language Dysfunction in Autism: Referential Communication and Perspective Taking in Autistic Speakers submitted by Joanne Volden in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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DEDICATION

To Mom and Dad...

whose support has always provided "shelter from the storm"

and

whose dreams for a better future sparked my curiousity and fuelled my commitment

and to Rick...

my brother, my mentor and my friend.

ABSTRACT

Pragmatic language skills have been identified as one frequently dysfunctional domain in autistic speakers. The current investigations were undertaken first, to establish the nature of the relationship between referential communication skill and the ability to assess and assume another person's conceptual viewpoint. The second purpose was to determine whether anticipated performance difficulties could be ameliorated by application of a brief, but directive, prompt and subsequently whether improved performance would generalize to a similar situation employing novel stimuli. Together these data were used to comment on the recently proposed "theory of mind" hypothesis as the root of autism's social and communicative dysfunction. A secondary purpose was to examine qualitative differences that emerge in the spontaneous language of autistic speakers and that could not easily be accounted for by a specific cognitive deficit in metarepresentation.

In the first study, ten high functioning autistic adolescents and young adults were matched for age, sex, and language skill to normally developing subjects, and presented with both referential communication and perspective taking tasks. A definitive relationship between referential communication and perspective taking skills could not be established due to unexpectedly high performance on the perspective taking task within the autistic group. Also contrary to expectations, there were no significant differences in performance on either task between the groups.

The second study was directed toward an examination of whether or not performance could be improved by the administration of a prompt, and whether anticipated improvements would persist in a generalization condition. Significantly improved performance occurred following administration of the prompt and was maintained in the generalization condition. Taken as a whole, these results suggest that difficulties in referential communication, and thus in the expression of presuppositional pragmatic competence, may not be fundamentally accounted for by disturbances in the autistic speaker's development of a "theory of mind".

In addition, given at least relatively intact perspective taking skill, the autistic speakers still displayed significant difficulties in a variety of pragmatic, syntactic and semantic language behaviours. Their presence serves to buttress the argument against a developmental deficiency in metarepresentation as the primary source of autism's communicative dysfunction.

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CHAPTER 1

Introduction

Autism is a developmental disorder defined by dysfunction in reciprocal social skills and communication and by restricted, stereotyped interests and behaviours with onset of symptoms before 36 months of age (DSM IIIR, A. P. A., 1987; ICD-10, W. H. O., 1987). While dysfunctional language is listed as a critical feature for classificatory diagnosis, there has been considerable debate as to the nature and the source of this communicative deficit. For example, some controversy has focussed on what sort of model best describes the language acquisition of autistic persons. Proposals for such a model have ranged from considering autism to be fundamentally a linguistic-specific disorder with behavioural and social sequelae (Churchill, 1978; Rutter, 1978) to, at the opposite extreme, attempts to account for unusual communication as secondary to deviant social and/or cognitive development (Fein, Skoff & Mirsky, 1981; Ricks & Wing, 1975; Rutter, 1983).

In addition, theoretical perspectives must account for characteristic autistic language behaviours that cover a broad spectrum ranging from no discernable, conventional mode of communication, through marked abnormalities in the form and/or content of speech, to impairment in the ability to initiate or sustain conversation with others despite adequate speech (DSM IIIR, 1987). Thus, while even the most advanced autistic children still demonstrate severe communicative dysfunction, their communication disorder presents as significantly different from the symptoms exhibited in those who are found at the other end of the continuum. Efforts to delineate the essential nature of the communicative deficit in autism must be able to exclude from consideration behaviours that might be a result of an accompanying condition such as mental retardation (Rutter & Schopler, 1987). Thus, although autistic children of normal, or close to normal, intelligence are a minority, the advantage of studying their behaviour lies in the likelihood that they will be the ones who demonstrate a deficit that is specific to autism and that cannot be attributed to concurrent mental retardation or generalized developmental delay (Bartak, Rutter & Cox, 1975). The

purpose of the studies presented here was to investigate issues related to both the nature and the source of the language disorder in autism by examining the relationship between one of the reported deficits in communicative behaviour of high functioning autistic speakers and a theoretical hypothesis recently advanced to explain the social and communicative dysfunction specifically associated with this population. In the long run, research of this sort should contribute to our understanding about the fundamental deficit(s) of autism as well as lead to more effective diagnosis and intervention.

Empirical studies of language development in those autistic children who had acquired some measure of verbal expression, revealed normal, although delayed, skill acquisition sequences in the semantic and syntactic domains of language (Cantwell, Baker & Rutter, 1978; Pierce & Bartolucci, 1977; Rutter & Schopler, 1987; Tager-Flusberg, 1981,1986). These results , as well as documented deficiencies in reciprocal social relationships, have led to recent attempts to account for the language deficit associated with autism in terms of a fundamental dysfunction in appropriate social language use, or the area of pragmatics (Tager-Flusberg, 1985a, 1989). While assigning the sole responsibility for autism's communicative dysfunction to pragmatic deficiency may well be an oversimplification (Volden & Lord, 1991), there have been many examples of pragmatic problems contributing to the disorder (Hurtig, Ensrud & Tomblin, 1982; McCaleb & Prizant, 1985; Wetherby & Prutting, 1984; Loveland, Landry, Hughes, Hall & McEvoy, 1988).

One specific area of pragmatic functioning that has recently drawn attention in both normally developing and disordered populations is that of referential communication, the ability to refer to things in such a way that a listener will know what is it that the speaker is describing (Iwan & Siegal, cited in Holdgrafer & Campbell, 1986). Although relatively simple to define, referential communication is, in fact, a complex phenomenon, composed of an intricate constellation of skills which serve to establish and maintain a joint focus of reference in a conversation. Thus, some facility with referential communication proves central to appropriate and functional communicative interaction.

In the normally developing population, successful referential communication has been linked to perspective taking skill (Roberts & Patterson, 1983). Although this relationship seems intuitively logical as clear message formulation should reasonably be related to some understanding of what a listener does or does not already know, several previous attempts to establish this link had failed (see review by Shantz, 1981). Roberts & Patterson (1983) reasoned that these failures had occurred because investigaters had attempted to establish a relationship between global measures of both perspective taking ability and referential communication. Instead of seeing perspective taking as a unitary or global phenomenon, Roberts and Patterson viewed it as a set of skills with each relevant to a particular context. Therefore, they assessed perspective taking skill and referential communication within the same context and succeeded in establishing strong correlations between the two.

They also proposed that at least two different levels of perspective taking skill are relevant for many referential communication situations. On the first level, the speaker needs to understand that the listener does not necessarily share the speaker's knowledge base. The second level involves determining what specific information the listener needs to know in order to adequately interpret the intended message. These two aspects of perspective taking are also mentioned by Loveland, Tunali, MacEvoy & Kelley (1989) as required for successful communication. Roberts and Patterson (1983) focussed on the second of these levels in establishing their relationship between specific perspective taking skills and referential communication.

One explanation for an inability to take another person's perspective might be an inability to determine another person's mental state or knowledge base. Recently, Baron-Cohen, Leslie & Frith (1985) offered a specific cognitive developmental deficiency in what is termed a "theory of mind" as a hypothesis to explain the types of social and language dysfunction noted in autistic speakers. This hypothesis suggests that autistic children are unable to conceive of another person's mental state. In other words, they are seen as unable

to predict what another person knows, wants, feels, or believes. If so, it naturally follows that autistic speakers would be unable to take a listener's perspective in order to formulate an appropriately informative message.

Although the Baron-Cohen et al. (1985) research suggests that the majority of autistic subjects will display deficiencies in even the first level of perspective taking skills, i.e. understanding that the listener does not necessarily share the speaker's knowledge base, some of their subjects were able to perform successfully on the level one task used. Of the 20 children tested, four were able to pass the item directed to predicting another's mental state. In a subsequent study, Baron-Cohen (1989b) tested those who had succeeded on the initial level on more sophisticated tasks. With this increased task difficulty, the autistic subjects again did less well than their matched controls. Thus, Baron-Cohen (1989b) concluded that all autistic children were impaired, at some developmental level, on the cognitive skills underlying a theory of mind, and that this constituted a specific area of developmental delay in this condition. In contrast to Baron-Cohen et al. (1985) and Frith's positions (1989), Boucher (1989) argues that imputing inability to assume another's perspective from failure to do so in an experimental situation is unsound. Instead, she posits that it is equally likely that autistic children might well possess the skill but fail to apply it. The current investigations are, in part, directed to an examination of this issue.

Loveland et al. (1989) began the study of referential communication skills in autistic speakers and suggested that their results supported the hypothesis offered by Baron-Cohen et al. (1985). Loveland and her colleagues (1989) investigated the ability of high-functioning verbal autistic adolescents and verbal mental age matched Down Syndrome subjects to perform a specific referential communication task. Although subjects for both groups were able to complete the task (teaching a simple board game to a listener), the subjects in the autistic group required specific prompting in order to produce the targeted information whereas most of the Down's Syndrome subjects did not. Loveland et al. (1989) interpreted these results as indicating that when the demands for a speaker to be aware of listener needs

were reduced by increasingly specific prompts, autistic subjects were more able to perform successfully. Thus, they suggested that autistic speakers' difficulties might lie in sufficiently anticipating the listener's perspective in order to select the information that is both necessary and appropriate for adequate communication. According to Roberts & Patterson's (1983) framework, this would be a disorder in the second level of perspective taking skill. Although Loveland et al's (1989) conclusions appeared reasonable, their study included no direct measurement of perspective taking ability. Thus, no direct test of the suggested relationship between referential communication failure and second level perspective taking skill deficits was undertaken.

The research reported here attempted to systematically investigate the relationship between referential communication and perspective taking in the autistic population. Some evidence has suggested that even high functioning autistic children experience difficulty in both domains. Although the same relationship as was established for the normally developing by Roberts & Patterson (1983) is often assumed to exist in the autistic population (Loveland et al., 1989), it has not yet been empirically established. Until it is, conclusions attributing dysfunction in one area to deficiency in another seem unwarranted. The first study directed itself to this issue by replicating Roberts & Patterson's work of 1983 using that subset of autistic subjects who demonstrated ability to complete the first level perspective taking task. Although Baron-Cohen et al. (1985) suggested these to be a minority, high functioning autistic children/adolescents were more likely to qualify due to the developmental nature of this ability as demonstrated in Baron-Cohen et al.'s work of 1985 and 1989b.

The second study extended the investigation by attempting to determine whether anticipated differences in performance occurring between autistic and matched control groups, were indicative of a specific cognitive disability (as suggested by Baron-Cohen et al., 1985) or a difficulty in application of existing skills (as proposed by Boucher, 1989). In the long run, resolution of this debate would provide information allowing more definitive statements about the fundamental nature of autism's communicative disability.

A secondary research concern was the issue of whether or not the deviant language noted in autistic speakers' expressive language performance was adequately explained by dysfunctional perspective taking and/or referential communication. Loveland et al. (1989) found, at their most general instructional level, that autistic subjects gave significantly more disorganized, repetitive, or ambiguous responses than Down Syndrome subjects who had been matched for verbal ability. That is, their expressive language could be described as qualitatively different, in terms of communicative effectiveness and efficiency, from that of their matched controls. However, as prompts became more specific, response adequacy between groups was no longer significantly different. Loveland et al. (1989) interpreted this as support for the notion that when autistic speakers cannot predict the listener's state of mind, they are unable to generate clear, informative messages. As situational structure was increased and the need to predict the listener's frame of reference diminished, the autistic child was more able to compose adequate, well-formed sentences. The implication is that if the demands of perspective taking were eliminated, the communication of autistic speakers would resemble the developmentally delayed language of the mentally handicapped child. However, the same type of qualitative differences were noted by Volden & Lord (1991) in the spontaneous speech of high functioning autistic speakers as compared to mentally handicapped and normally developing controls. In this case, they occurred in a poster/story description task where perspective taking ability would not seem to be required because the same stimulus was readily available to both parties. Thus, because dysfunctional communication was noted in a situation that appeared to be independent of perspective taking requirements, these results were interpreted as suggesting that deviant expressive language was not solely attributable to deficiencies in perspective taking skill. In addition, Pacci-Cooper, Curcio & Sacharko (1981, cited in Curcio & Paccia, 1987) documented significant abnormalities in several aspects of discourse management, such as turn-taking, topic maintenance etc. Although the experimental tasks used in the current studies were intrinsically more structured and controlled than those in any of the above investigations,

qualitative differences, as measured by indices of communicative efficiency and appropriate conversational control, were examined when they emerged in the verbal output of the autistic children as compared to the control groups and results interpreted in light of their contribution to the support or disconfirming of one current theoretical hypothesis.

In summary, the purpose of the present study was to investigate the nature and source of the language deficit associated with autism through an examination of high functioning autistic speakers' performances on two structured tasks: referential communication and perspective taking. These data were used to comment on the likelihood of a deficient theory of mind being responsible for the social and communicative dysfunction associated with autism. In addition, qualitative language differences that emerged differentiating the autistic from roughly equivalent language control groups, were assessed and offered as evidence contrary to the hypothesis in question. Chapter 2 reviews the literature that led to the current investigation.

CHAPTER 2

Review of the Literature

Since Kanner's (1943) first description of autism, communicative disorders have been considered a criterial feature in its diagnosis; yet considerable controversy has persisted about the nature of these deficits, their source, and their role in definition of the syndrome. Still, movement toward understanding language development within autism is seen as important because it is a key prognostic factor (Rutter, 1983) and because such an understanding should lead to improved therapeutic efforts (Tager-Flusberg, 1989). The current investigations address issues of both the nature and the source of the language disorder in autism by examining the relationship between one area of reported communicative deficit and a hypothesis recently advanced to explain social and communicative dysfunction in the disorder. This chapter is devoted to a brief review of the literature directed to language acquisition and development in autism and a more intensive examination of the research directly leading to the investigations reported here.

Research examining language acquisition and development in the autistic population has focussed on a variety of issues such as whether language in autism is better characterized as delayed or truly deviant, whether or not the language deficit is global and if not, which specific aspects of language are dysfunctional and, finally, whether the language deficits are primary and fundamental or better explained as sequelae of cognitive and/or socio-emotional disturbance (Baltaxe & Simmons, 1981; Tager-Flusberg, 1989). Each of these issues has generated considerable discussion, but none has yet been adequately resolved. Conclusive research in the area of language acquisition and development in the autistic population has been difficult to find for a variety of reasons. Many studies have been based on case reports or clinical impressions (Ricks & Wing, 1975; Tager-Flusberg, 1981). Unfortunately anecdotal data, however rich, is insufficient for reliable, generalizable conclusions (Tager-Flusberg, 1989). In the few systematic, experimental studies that have

been done, frequent methodological problems were found. For example, in some cases, no attempt was made to compare the language of the autistic population to that of appropriate control groups (Baltaxe & Simmons, 1981, Tager-Flusberg, 1989). In others, Tager-Flusberg (1981) noted that diagnostic criteria and methods for subject selection were not uniform across studies, that some investigations failed to control for age and/or developmental level, that methods to assess linguistic performance were often inadequate, and that in cases where the language performance varied widely among subjects, potentially significant language differences may have been obscured. In addition, most early studies employed very simple analyses focussing on aspects of syntax and semantics that are normally acquired very early in development (Bartak et al., 1975; Cantwell et al.,1978; Howlin, 1984). While such information is undeniably valuable, such research may not reveal important concerns that emerge as language becomes more sophisticated. Finally, very few investigations have extended beyond a single linguistic domain. For example, people have investigated syntax or semantics, but rarely both at the same time. Thus, the potential impact of dynamic interactions among developmental domains on communicative performance has been ignored (Tager-Flusberg, 1987).

To consider the role of language in autism, one must first consider the nature of language itself and its relationship to other aspects of development such as a child's cognitive abilities and his/her social-emotional functioning. Current theoretical perspectives view language as a complex and multifaceted system which has at least three major components: linguistic structure or syntax, the construction of meaning or semantics, and the appropriate, social use of language or the area of pragmatics (Bloom & Lahey, 1978). These systems are separable in terms of their definition and attempts are made to isolate them in psycholinguistic research, but in reality they interact both intricately and extensively (Tager-Flusberg, 1989). In addition, language is widely acknowledged to arise from a variety of experiential bases, having its roots in general cognitive and social development as well as the specifically linguistic stimulation of the culture into which the child is born (Berko-Gleason, 1989; McLean &

Snyder-McLean, 1978; Owens, 1988). Thus, language competence is integrally related to development in other domains. Tager-Flusberg (1989) sums up this relationship by saying: "In the normally developing child, one finds strong connections among cognitive functioning, social interaction, and language and communication, such that, in normal development, language is inextricably linked to these other developmental systems, and these distinct aspects of development are in close synchrony with one another." (p. 94) Asynchronous development, or deficits in any one, of these developmental domains, could be ultimately responsible for a disorder in language functioning. For this reason, it is important to consider the whole developmental profile when trying to understand the language disorder associated with any particular clinical phenomenon.

Prelinguistic Communication

The foundations for linguistic and communicative competence are laid very early in the child's development. Well before the child utters his/her first word, (s)he is participating in communicative exchanges with his/her caregiver. These exchanges range from mutual eye contact accompanied by speech (on the caregiver's part) and vocalization (on the the part of the baby) to fully elaborated gestures serving to direct and control adult behaviour. (For a full review of communicative development in infancy, see Owens, 1988 or Sachs, 1989). One need only observe young children to conclude that they are fully capable of successfully communicating a message without using a single word. A good example is found in the 10 month old daughter of friends of the author who not only requested that her father read her a story, but specified where he should sit to do so, by a combination of pulling on his trousers and pointing emphatically to a spot on the floor.

Unfortunately, little is known about the life of the autistic child in the first year as definitive diagnosis is difficult within this time period, but some evidence exists to suggest that their communicative deficit begins as early as the prelinguistic period. For example, Ricks and Wing (1975) reported that mothers of autistic children sometimes found it difficult to interpret their babies' cries in contrast to mothers of normally developing infants.

In addition, while preverbal, normally developing children have been shown to use at least two general communicative functions (protodecalaratives - to establish joint attention with an adult on an object and protoimperatives - to get something from an adult) (Bates, 1979), mixed results have been obtained in similar examinations of autistic children. Comprehension and production of instrumental gestures (Attwood, Frith & Hermelin, 1988) or proto-imperative gestures (Baron-Cohen, 1989c), where a change in interlocutor behaviour is the desired result, have been reported as unimpaired. However, gestures directed to sharing awareness of an object's existence or its properties were noted to be absent in the autistic population by Curcio (1978), Mundy, Sigman, Ungerer & Sherman (1986, 1987), and Wetherby (1986). Baron-Cohen (1989c) also found that autistic children do not seem to employ protodecalarative gestures (e.g. pointing at an object just to show it to the adult, in essence to comment or remark upon the object) even when subjects' general cognitive level would suggest that requisite skills are present.

Further evidence of early gestural impairment arises from work carried out by Loveland & Landry (1986) and Landry & Loveland (1988). In these studies, when autistic children were compared to developmentally language delayed children and to younger normally developing children, matched on mental age (MA) and on mean length of utterance (MLU), the autistic group was less able to respond to gestures used to "indicate" or to "show" and also used gestures for the same functions less frequently. A follow-up study by Landry & Loveland (1989) confirmed these results when communicative gestures were measured across three different social contexts. Here, while developmentally language delayed and normally developing children produced differing amounts of "showing" and "pointing" in response to different situations, autistic children produced very few of these gestures in any context. Contradictory results were reported by Ricks & Wing (1975) who cited pointing as one of the earliest gestures used by autistic children, however Attwood et al. (1988) suggest that these gestures may have been employed in the service of protoimperative functions

rather than the more social function of establishing joint reference or joint attention with the conversational partner.

Several points are noteworthy here. First of all, autistic children have consistently exhibited gestural communicative impairment in very early interactions and this impairment has been demonstrably different from the profile displayed by equivalent language controls. While this is not surprising given the pervasiveness and the severity of the communicative deficit associated with autism, it stands in opposition to the notion that the source of autism's social and communicative dysfunction is attributable to specific delays in the development of metarepresentation or the currently popular "theory of mind" hypothesis (Leslie, 1987 ; Frith, 1989). According to Baron-Cohen (1989c), joint attentional gestures are of interest because, like a theory of mind they involve a child co-ordinating attention with another person, but unlike a theory of mind, they are demonstrably present in the second year of life in normal children. In addition, they are viewed as precursors to several more advanced communicative behaviours and as such play a central role in language acquisition (Baron-Cohen, 1989c; Landry & Loveland, 1988). Thus, impairment here supports the notion that communicative dysfunction in autism precedes specific developmental deficits in higher level cognitive representational functions. Secondly, while Landry & Loveland (1988) compared the autistic group to normally developing 2 year olds and still found significant differences in attention-directing gestures, they suggest the possibility that the gestures (e.g. touching/taking or looking) of the experimental subjects might be similar to those of even younger normally developing children even though their mental ages and mean lengths of utterance were much higher. If so, this would be an example of the asynchronous development posited by Tager-Flusberg (1989) where some aspects of development proceed and others, normally proceeding in concert with them, lag behind. Finally, the Attwood et al. (1988) study noted that the frequency of interactional initiations was significantly reduced in the autistic group and that this appeared as independent of general cognitive functioning. Thus, abnormalities in the pattern of communicative exchange are consistently found in the autistic group relative to

equivalent language controls . Taken as a whole these results suggest that the origins of autism's communicative deficit may be demonstrated in developmentally early preverbal communication skills which are viewed as pre-requisite to more advanced communicative forms; and before one would expect the development of high level cognitive representational functions. While this does not preclude subsequent deficits in metarepresentation, it does suggest that metarepresentational dysfunction may not be primarily or fundamentally responsible for the communicative disorder associated with autism.

Beyond the preverbal period, language acquisition and development research has traditionally focussed exclusively on exploring the patterns of acquisition for various aspects of language structure (syntax), and the construction of meaning (semantics). More recently, psycholinguists have begun to expand that focus into an examination of the uses to which language and communication are put, an area of study known as pragmatics. This focus and the recent shift has been mirrored in the literature dealing with the language disorder in autism. The following review of the current status of knowledge about language acquisition and development in autism will focus as much as possible on notions upon which consensus has been achieved, and on more recent studies which have avoided some of the methodological problems outlined earlier. Many of these investigations have concentrated on higher-functioning autistic children, mostly because they have been shown to be most likely to demonstrate spontaneous language skills and because understanding their deficits should lead to understanding the dysfunction that is both necessary and specific to autism (Rutter, 1983, Tager-Flusberg, 1989). Only by eliminating the influence of mental retardation can one hope to isolate communication problems that are attributable specifically to the phenomenon of autism.

Syntax

The domain of linguistic structure can be subdivided into several more specific areas such as phonology (the acquisition of speech sounds), morphology (combination of speech sounds into meaningful units), and grammatical rule use or syntax (the combination of

meaningful units into sentences). Studies on each of these areas have been carried out on autistic children. There is general agreement in the literature that, in those autistic children who do acquire some measure of spoken language, no significant problem exists in the area of phonology, or the acquisition of speech sounds (Bartolucci, Pierce, Streiner & Tolkin-Eppel, 1976; Baltaxe & Simmons, 1981; Boucher, 1976; Rutter, 1983; Tager-Flusberg, 1981). While articulatory development might well be delayed in the autistic population, it appears to be a dysfunction that is adequately accounted for by generalized developmental or cognitive delay. Thus, deficits in phonology are considered to be neither necessary nor specific to the phenomenon of childhood autism. In fact, in some investigations, the phonologic skills of the autistic children have been less impaired than those of receptive language disordered controls (Cantwell et al., 1978).

A consensus has also largely been achieved in the literature examining the development of linguistic morphology and syntax. On the whole, researchers agree that no specific deficit, other than developmental delay, in linguistic structure characterizes the syndrome of autism. Capping a long line of studies (Bartak et al., 1975; Cantwell et al., 1978; Cunningham, in Tager-Flusberg, 1981; Pierce & Bartolucci, 1977), all of which found delayed but normally sequenced, rule-governed syntactic development in the autistic population, is Tager-Flusberg's report in 1989 of an ongoing, longitudinal study of language acquisition in a group of higher functioning autistic children. While these results are still considered preliminary, she found no significant differences in structural acquisition patterns between the autistic children and language matched Down Syndrome and normally developing controls. Based on these data, Tager-Flusberg (1981, 1989) concluded that no significant differences existed in the syntactic domain between autistic speakers and language matched controls, and thus that any specific language deficit in autism must be sought in other language areas.

On the other hand, while it seems clear that early developing syntactic skills are intact within the autistic child's repertoire, Volden & Lord (1991) found, in the language of some

autistic speakers, evidence of syntactic errors that would not have been addressed in the investigations thus far reported. Volden and Lord collected language samples from groups of higher-functioning autistic (verbal IQ's greater than 80), lower-functioning autistic (verbal IQ's between 45 and 79), mentally handicapped, and normally developing children and adolescents. All groups were matched for chronological age and sex. In addition, the higher-functioning autistic group was matched to the normally developing group and the lower-functioning group was matched to the mentally handicapped group on the basis of language skill. When errors commonly attributable to developmental delay were removed, errors in syntactic construction persisted. In fact, the higher-functioning autistic group made more of these "non-developmental" syntax errors than either their language matched controls or mentally handicapped children with significantly lower verbal IQ's and receptive vocabularies. Because of these differences in linguistic profile, these results were interpreted to indicate some syntactic deficit beyond what would reasonably be accounted for by generalized developmental delay. Futher research into more sophisticated levels of syntax is needed before firm conclusions about the integrity of linguistic structural development in autism can be reached.

Semantics

The semantic domain of language, dealing with "meaning" or "content" has often been suggested as the source of the communicative deficit associated with autism (Hermelin & O'Connor, in Tager-Flusberg, 1986; Ricks & Wing, 1975). However, these studies didn't distinguish between semantic dysfunction that is due to a failure to form either conceptual or linguistic categories and a failure to spontaneously and correctly use the categories that they have (Tager-Flusberg, 1989). Subsequent attempts to systematically investigate this question have indicated that autistic children do form conceptual categories for concrete objects (Tager-Flusberg, 1985a; Ungerer & Sigman, 1987), that they are able to represent word meanings (Tager-Flusberg, 1985b) and that they demonstrate naming ability (Tager-Flusberg, 1986a) in much the same way as language matched normally developing and

mentally handicapped controls. Tager-Flusberg (1989) concluded, from these data , that the semantic domain of language competence was also largely unimpaired outside of generalized developmental delay.

In opposition to this view, Bartolucci, Pierce & Streiner (1980) proposed that specific semantic deficits might still be found in the development of relational terms such as copular verbs, prepositions etc. Ungerer & Sigman (1987) also caution that an intact ability to form linguistic and/or conceptual categories may not ensure adequate semantic development. Further, Cantwell et al., (1978) and Lord (1985) have also found significantly greater problems for autistic as opposed to control groups in the comprehension of language.

In addition, as with syntax, most of the studies dealing with semantics have focussed on fairly elementary skills. We still have little notion about the course of semantic development in the autistic child beyond the 4 year level. Investigations of the process of semantic reorganization in response to expanding cognitive and linguistic experience, the formation of abstract word meanings, the use of metaphor and analogy, all remain to be examined. Such subjects can only be investigated by examining the language of older, higher-functioning autistic children. Volden & Lord (1991) used such a sample in their investigation and found significantly more semantic errors in the autistic groups than in their language matched controls. Semantic errors were coded when independent raters judged that one or more words within an utterance were odd or unusual when compared to a standard English paraphrase of the utterance. Interestingly, as IQ scores increased within the autistic groups, the number of semantic errors went up, while the inverse trend was noted for the mentally retarded children. For the mentally handicapped group, semantic errors increased as IQ level diminished. These results were interpreted to suggest that some semantic deficit does exist in the language of autistic children, beyond that accounted for by developmental delay, even though investigations to date have not identified its source.

Pragmatics

Recently, investigators have turned their attention to the area of pragmatics, or the functional use of language in context, as the potential source of the language difficulty associated with autism. Early evidence of communicative problems that could be generally described as pragmatic is found in descriptions of "autistic language" as "literal", "peculiar and out of place in ordinary conversation", "irrelevant and metaphorical" (Kanner,1946); and "formal, [demonstrating] a lack of ease in the use of words" (Rutter, 1965, p.41). Aside from these clinical, descriptive observations, Bartak et al. (1975), studied groups of autistic and developmentally receptive language delayed children similar in terms of mean length of utterance (MLU) and grammatical complexity of speech. When their parents were interviewed, the autistic children were described as using "stereotypic utterances", "metaphorical language" and "inappropriate utterances" significantly more often than the dysphasic group. In a follow-up study of the same subjects, Cantwell and his colleagues (1978) sought to test these parental impressions by analyzing the spontaneous language of 12 autistic and 12 dysphasic boys matched on age and nonverbal IQ. Language samples were analyzed for syntactic complexity and coded according to several socialized (i.e., normal) and a few "abnormal" functional speech categories. While diagnostic groups were found to be very similar on all measures of syntactic complexity, significant differences were found in "functional usage". On the whole, autistic children demonstrated significantly greater use of abnormal speech categories, e.g. metaphorical language. Thus, some communicative problems that would today be assigned to the realm of pragmatics were documented in early descriptions of the phenomenon.

In addition, there are several converging trends that account for the recent shift in focus. First, an increased emphasis on social language use emerged in the literature dealing with normal language development (Bates, 1976; Halliday, 1975; Snow & Ferguson, 1977). A concomitant expansion to a similar examination across all sorts of language disordered children was both a logical and natural extension (Gallagher & Prutting, 1983; Rees, 1978).

Additionally, within the study of autism, two factors encouraged a change in research emphasis. One was a renewed emphasis on the social deficit as fundamental to the phenomenon (Hobson, 1989; Mundy & Sigman, 1989; Prior, Dahlstrom & Squires, 1990; Schopler & Mesibov, 1986; Rutter, 1983). This naturally caused an orientation to the social aspects of communication in research efforts to discover a unifying thread across the symptoms associated with the disorder (Baron-Cohen, 1988). Second, although more recent evidence suggests that syntax and semantics are not entirely preserved in the language of even the highest functioning autistic children (Volden & Lord, 1991), there had been a previous growing consensus that specific aspects of linguistic structure and meaning were unimpaired leaving the domain of pragmatics as the only area remaining to account for the communication difficulties which are integral to the disorder (Fay & Schuler, 1980; Tager-Flusberg, 1989).

Two schools of thought may be regarded as contemporary regarding the role of pragmatics in governance of the language and communication system. Traditionally, linguists have considered syntax, semantics and pragmatics as equally important aspects of language, a view termed the formalist perspective by Owens (1988). More recently, an alternative notion, termed functionalism (Owens, 1988) or "pragmatics-as-perspective" (Skarakis-Doyle, 1990) has begun to achieve some prominence. Within this view, theorists reason that language is heavily influenced by context and that a need to communicate exists prior to the selection of specific semantic content or particular linguistic form. For example, a child's desire to get a cookie preceeds his/her request and the specific request format may be tempered by who is in the room (e.g. Mom versus Grandma), time remaining until the next meal, etc. Therefore, within this framework, pragmatics is assigned a super-ordinate role in the hierarchy of language components and is seen as the overall organizing aspect of the communication system.

This issue will not be directly addressed in this document as within either perspective, the domain of pragmatics may be seen to include the following social aspects of language: (1)

specific communicative functions or "speech acts" (e.g. requesting, informing, greeting, etc.) (Dore, 1974; Halliday, 1975; Prutting, 1982), (2) conversational knowledge (knowledge about the rules governing discourse in the speaker's society, e.g. how to initiate topics, how to terminate interactions, how to shift topics, etc.) (Gallagher, 1990; Wetherby, 1986) and (3) presuppositional knowledge (the ability to make appropriate judgments about the form an utterance must take in order to sufficiently communicate the speaker's intent e.g. what information to include and what not to, what to emphasize, etc.) (Gallagher, 1990). Some research in each of these areas has been done with regard to the language impairment associated with autism.

Speech Acts

In the general area of specific communicative functions or "speech acts", Ball (cited in Baron-Cohen, 1988; Tager-Flusberg, 1981) compared the spontaneous speech of 5 autistic, 5 developmentally aphasic, and 5 normally developing children matched on verbal mental age. She found the range of communicative functions (such as relating past experiences, commenting on objects etc.) to be severely restricted in the autistic population in comparison with matched control group subjects. Similarly, Shapiro, Fish & Ginsberg, (1972, in Tager-Flusberg, 1989) and Paul & Cohen (1984) also reported a paucity of language directed to requesting or sharing information, in their autistic groups.

Loveland et al. (1988) examined the use of language and gesture in free play interactions with a parent. Groups of autistic children, developmentally language delayed and normally developing children were matched on language age and compared in terms of their uses of language and gestures. Results revealed significantly different profiles of speech act usage between groups, suggesting that the autistic group had a grasp of pragmatic language skills that was less than that of a normal 2 year old. However, cautious interpretation of these results was also suggested due to substantial variability in all groups. Further, language samples were obtained from a single, brief interaction. In addition, Loveland et al. (1988) remind the reader that the intention of a particular act is often difficult to decipher and thus

hard to classify, because it has been suggested that autistic children may express their intentions via unconventional means such as echolalia (Prizant & Duchan,1981; Prizant & Rydell, 1984). A similar finding was reported by Hurtig, Ensrud & Tomblin (1982) where they found that stereotypic question production was used as a conversational strategy to initiate or maintain a conversation in contrast to the conventional function of questions as instruments for requesting information.

Wetherby & Prutting (1984) compared the spontaneous speech of 4 autistic children to 4 normally developing children matched on MLU. When specific communicative functions were compared, Wetherby & Prutting found that the autistic children consistently displayed a more limited repertoire. Although the autistic children exhibited as many interactive acts as the normal controls, they did not demonstate the variation and flexibility of communicative function employed by the normally developing children. Wetherby & Prutting found that the autistic group appeared to communicate more for fulfillment of desired environmental consequences rather than for more purely social ends. Further, Wetherby (1986) suggested that while both social and non-social functions emerged simultaneously in the normal population, a different developmental order could be observed in the autistic population with non-social functions emerging first and social communication emerging significantly later, if ever. Although her argument is persuasive, one is cautioned against wholesale acceptance of this notion pending replication of these results with a larger sample.

Tager-Flusberg (1989) argued that some social functions were indeed employed by autistic speakers (e.g. responding) and that the deficit in speech act usage was better defined in a narrower fashion, such as the autistic speaker being unable to use speech acts that required an awareness of another's mental state. On the other hand, Bates (1976) argues that the "very act of communicating involves some degree of social engagement, and to engage in intentional communicative behaviour one must have some notion of social means-ends and social causality" (p. 21). Thus, from this perspective, the very notion of intentional communication, a concept that is no longer in dispute with regard to autistic children, requires

at least a rudimentary understanding on their part that another party is involved and has some part to play in the interaction.

On the whole, the studies addressed to the notion of speech act usage seem to agree that autistic children exhibit a different profile of speech acts than language matched control children. However, this consensus is weakened by the fact that no two studies have used the same classification system to categorize the speech acts drawn from the language sample data base.

Conversational Knowledge

Conversational knowledge, or discourse management, refers to that aspect of communicative competence which facilitates the smooth flow of an interaction. Specific skills that fall within this realm are abilities in appropriate topic introduction, and maintaining the smooth flow of an interaction through functional turn-taking, appropriate termination strategies, etc. Both strengths and weaknesses have been reported in the autistic population in this domain. Fay (1969), McEvoy, Loveland & Landry (1988), and Shapiro (1977), reported the use of echolalia by autistic children in the service of discourse management functions. Fay (1969) and McEvoy et al. (1988) indicated that echolalia was sometimes employed as a conversational device to maintain a social interaction, to mark a turn, even when the content of the interaction was not being understood. Shapiro (1977) cited examples of echolalia as a mechanism to achieve social closure. As mentioned in the previous section, Hurtig et al. (1982) found evidence that persistant stereotypic question production was used to initiate and/or maintain an interaction rather than its conventional function of requesting information. While none of these constitutes a conventional application of those specific linguistic devices, it does demonstrate some awareness on the autistic child's part of the need for conversational management and the need for some means to initiate, maintain and terminate an interaction.

Further evidence of an awareness of the social demands of communication is found in studies examining differential responsiveness in different situations. Bernard-Opitz (1982)

examined the incidence of communicative acts by autistic children in interaction with three different adults, the child's mother, their speech-language clinician, and an unfamiliar adult. Communication increased as a function of familiarity with the conversational partner, showing that autistic children were not oblivious to socially salient variables. McHale, Marcus, Simeonsson, & Olley (1980) also investigated the effects of social partner on autistic childrens' communication and found that communicativeness occurred more when interacting with the classroom teacher than with a non-interactive adult observer. While these results may also be attributed to conversational differences by the interactional partner, some level of responsiveness to differential social situations by the autistic person is indicated.

While awareness of the need to use language in order to participate in interaction has been demonstrated, there also exists ample evidence that the autistic child experiences considerable difficulty managing conversations appropriately. Pacci-Cooper, Curcio & Sacharko (1981, cited in Curcio & Paccia, 1987) found that autistic children interrupted twice as often, were inappropriate or irrelevant in their interruptions, changed topic twice as much and in general used more inappropriate responses than normal children matched on sex and language skill. Similar results were obtained by Hinerman & Channel (1986) in their study of autistic speakers' discourse skills. Autistic speakers and language matched controls differed significantly on measures of topic maintenance and turn-taking. Fay & Schuler (1980) and Tager-Flusberg (1982) also report difficulties in appropriate turn-taking.

Discourse management skills are often assessed by evaluating people's ability to repair communicative breakdown. Paul & Cohen (1984) examined adults classified as displaying pervasive developmental disorder (PDD) of which autism is an example, and performance IQ matched mentally retarded individuals on their ability to respond appropriately to contingent requests for clarification (e.g. Speaker 1: "I had a cold yesterday". Speaker 2: (Contingent query, request for clarification) "A what?"). Significant group differences were found with the members of the autistic or PDD group consistently less able to respond appropriately. Interestingly, they were sensitive to the need to revise their utterance in

response to the contingent query, but were generally less specific in their revision. On the whole, they were less flexible in their response. The mentally retarded individuals were more likely to revise the queried utterance in some way while the members of the PDD group were more likely to repeat the entire utterance. Because language differences between the groups were not controlled, and substantial discrepancies in language level were apparent, group differences in performance may be largely attributed to language skill. However, Paul & Cohen (1984) argue that these cannot be wholly responsible as normal children of age 2 easily respond flexibly to these tasks. On the whole, while it appears that autistic speakers possess some notion of the requirements for sustaining conversational interaction, they experience difficulty in appropriately doing so.

Presuppositions

A final sub-domain of pragmatic competence, and the area in which the current investigations are concentrated, is the notion of presuppositions. The concept here is that effective interactions proceed on the basis of appropriate presupposed ideas that the speaker holds about the listener and the listener's knowledge. Several different skills may be cited as within the realm of presuppositional competence. One instance is what has come to be called encoding new versus old information. Once a topic has been established, subsequent utterances need not re-establish it; the speaker can proceed by adding new information because (s)he pre-supposes that the listener already shares the subject of reference. For example, one adult offers another a cup of coffee. This may be followed by statements such as "It's fresh", "It's Columbian" or questions like "How do you take it?", or "Cream and sugar?". None of these follow-up utterances make specific reference to the act of drinking coffee, yet all would be appropriately interpreted as referring to the previously established topic. The notion of presuppositions suggests that in order for this communication to be correctly interpreted and thus effective, the speaker must possess some idea of what the listener is focussing on. Difficulties in appropriate foregrounding of new information have been reported in the autistic population in studies by Baltaxe (1977,

1984) and McCaleb & Prizant (1985). While these studies all employed very small sample sizes and in some cases, no control group against which normative comparisons could be made, autistic speakers were shown to be less than optimally proficient at appropriate encoding of new rather than previously given information.

Presuppositional competence also includes knowledge held by the speaker about the manner of utterance that would be considered most socially appropriate, given certain properties of the situation, the listener, the intended function of the utterance etc. For example, for the communicatively competent, asking a favour of your employer is generally undertaken in a more formal, and sometimes obsequious manner than asking a favour of one's sibling. These registral variation skills have been suggested to be deficient in the autistic population. For example, Baltaxe (1977) examined the dialogue of 5 autistic adolescents and found them to exhibit difficulty in maintaining an appropriate language style for the social demands of the situation. For example, in a situation that was clearly meant to be examiner directed and controlled, the autistic subject might interrupt frequently (another example of Pacci-Cooper et al.'s (1981, cited in Curcio & Paccia, 1987) dysfunctional discourse management skills) or attempt to direct the examiner. Other examples where the subject was overly formal or used the jargon of a specific group (e.g. sportscasters) have long been noted in clinical anecdotes and case reports (Bartak et al., 1975; Cantwell et al., 1978; Kanner, 1946; Rutter, 1965).

Paul & Cohen (1985) examined a related proposition by assessing comprehension of indirect request forms (e.g. "Is it cold in here?" may be considered an indirect request for closing the window). Autistic and mentally retarded adults, matched on performance IQ, were evaluated on their appropriate responsiveness to such requests in both structured and unstructured situations. Significant group differences were found. Again, as in their 1984 study, there were substantial language level differences between the groups, so differential performance is not particularly surprising. However, Paul & Cohen (1985) point out that if differences in linguistic comprehension were the sole determining factor one would expect

similar performance within groups across both structured and unstructured conditions. This occurred for the mentally handicapped controls but was not the case for the autistic group. They performed much better within the structured task. Paul & Cohen (1985) suggested dysfunction in some aspect of social cognition to be responsible for this presuppositional pragmatic deficit.

Thus, from these results, it would appear that, in addition to problems in other areas of pragmatic function, autistic speakers may also have consistent difficulty in the area of presuppositional skills. The source of these has not been definitively identified but has been suggested as an underlying dysfunction in some aspect of social cognition. Given the intricate interrelationships of cognitive, social and linguistic developmental domains in the development of communication, the relative influence of any one domain is difficult to disentangle from the effects of the others. One approach toward this end is to address the issue from a variety of directions, hoping to identify commonalities that in the long run would suggest a convergence of the evidence toward specific fundamental problems.

Therefore, another avenue through which presuppostional pragmatic skills may be investigated is the referential communication paradigm. Referential communication is the ability to refer to things in such a way that a listener will know what it is that the speaker is describing (Iwan & Siegal, cited in Holdgrafer & Campbell, 1986) and referential communication tasks involve a speaker being asked to describe a referent object or picture so that the listener is able to select a target referent from a set of potential referents on the basis of the speaker's verbal message. In order to be effective, an adequate message, composed of a description of the attribute(s) that distinguish the target from the potential or foil referents, must be constructed by the speaker. Presuppositional skills would be involved in the speaker's assessment of what the listener already knows and what remains to be communicated, or the ability to evaluate the listener's perspective. While the experimental referential communication paradigm is somewhat artificial, i.e. rarely in the real world are we required to specifically communicate about objects that have been deliberately concealed,

the phenomenon it represents has a significant application to everyday conversations. Referential communication skills serve to establish and maintain a joint focus of reference in a conversation and thus prove central to effective communicative interaction.

In the normally developing population, successful referential communication has been linked to perspective taking skill (Roberts & Patterson, 1983). Although this relationship seems intuitively logical as clear message formulation should reasonably be related to some understanding of what a listener does or does not already know, previous attempts to establish this link had failed (see review by Shantz, 1981). Roberts & Patterson (1983) suggested that these failures had occurred because investigators had attempted to establish a relationship between global measures of both perspective taking ability and referential communication. Instead of seeing perspective taking as a unitary ability, Rogers and Patterson viewed it as a set of skills with each relevant to a different context.

They also proposed that at least two different levels of perspective taking skill are relevant for many referential communication situations. On the first level, the speaker needs to understand that the listener does not necessarily share the speaker's knowledge base. The second level involves determining what specific information the listener needs to know in order to adequately interpret the intended message. Roberts and Patterson (1983) focussed on the second of these levels in establishing their relationship between specific perspective taking skills and referential communication.

Thus, their study differed significantly from previous attempts in two important ways. Instead of considering perspective taking to be a general skill, they narrowed their focus to the perspective taking skills needed in a particular situation. Roberts & Patterson (1983) assessed perspective taking skill and referential communication on two separate tasks but within the same communicative environment and using the same stimulus materials. Secondly, they isolated the second level of perspective taking skill, that of predicting which specific information was lacking in the listener's perspective, in their attempt to establish a relationship.

This landmark study, and the ones to follow, will be reviewed in some depth as they pertain directly to the research reported in this paper. Subjects were 42 normally developing children ranging in age from 3-10 to 6-3 with a mean age of 58 months. Children were seated at a table in a quiet room, across from an adult who acted as the listener in the interaction. An experimenter sat between them. Stimulus materials consisted of pairs of identical cards, each containing two possible referents. Referents varied on four dimensions but differed on only one. Thus, on each card, the target referent could be distinguished from the foil referent by a single feature. Both the subject and the listener received one of the pair of identical stimulus cards, but only the subject was notified which of the two potential referents was the target. For the referential communication task, the subject was asked to identify the referent for the listener. In the perspective taking task, the subject was required to judge which of a series of messages communicated by the examiner to the listener was sufficient for the listener to identify the target referent. Screening procedures ensured that only subjects who were able to spontaneously identify the dimension employed on the stimulus cards, and who were able to perform accurately on the first level of perspective taking (i.e. knowing that once the target was identified, that they possessed information not available to the listener) were included. Scores on the referential communication task were classified in terms of their effectiveness. Roberts and Patterson's (1983) findings were consistent with their prediction that ability to assess the listener's informational needs accurately should correspond to the ability to communicate clearly informative messages. Correlations between optimally effective scores for the referential communication task and the scores on the perspective taking measure were both positive and significant.

The nature of this relationship in the autistic population has not been investigated, yet is interesting from a number of perspectives. First of all, as previously mentioned, successful referential communication can easily be seen as central to appropriate and functional communication. After all, maintenance of a joint focus of attention is fundamental in the pursuit of effective message transmission. Therefore, given the evidence of pervasive

difficulty in presuppositional pragmatic competence within the autistic population and the documented difficulties in preverbal joint attention skills, one is led to question the extent to which those difficulties persist in those of the autistic population who do develop speech. While the referential communication paradigm is unnaturally structured and artificial, studies of specific, circumscribed referential communication tasks may, given the centrality of joint reference to clear, efficient communication in less structured contexts, lead to appropriate inferences about the autistic speaker's competence in spontaneous conversation .

Secondly, while the link estabished by Roberts & Patterson (1983) between the two skills of referential communication and perspective taking was correlational rather than causal, its presence, if substantiated in the autistic population, has some implications for the support or disconfirming of a theoretical hypothesis recently advanced to explain the social and communicative dysfunction associated with autism. This hypothesis is generally known as the "theory of mind" hypothesis and was first introduced by Baron-Cohen, Leslie & Frith in 1985. A review of studies directed to an examination of this hypothesis follows.

Theory of Mind

Inability to take another person's perspective can be conceived, at least in part, as an inability to determine another person's mental state or knowledge base. Recently, Baron-Cohen, Leslie & Frith (1985) offered a specific cognitive developmental deficiency in what is termed a "theory of mind" as a hypothesis to explain the types of social and language deficiencies noted in autistic speakers. This hypothesis suggests that autistic children are unable to conceive of another person's mental state. In other words, they are seen as unable to predict what another person knows, wants, feels, or believes. If so, it naturally follows that autistic speakers would be unable to take a listener's perspective in order to formulate an appropriately informative message. Therefore, if this hypothesis were true, one would expect substantial difficulties in any task related to assessing and predicting another person's state of knowledge, and accompanying deficits in the ability to communicate clearly when the situation demands that effective messages be predicated on that assessment. The paradigm used by

Roberts & Patterson (1983) offers a reasonable context in which to test this assumption, as it represents one situation where the relationship between the two skills has been documented within the normally developing population. Replicating the Roberts & Patterson (1983) investigation with autistic subjects provides the means for assessing whether or not the two skills are related similarly in the autistic population as they were found to be in normals. If so, then deficits in one skill may well be linked to dysfunctional performance in the other as suggested by Loveland et al. (1989). It also provides the opportunity to examine group differences in referential communication and perspective taking skill. According to the theory of mind hypothesis, autistic subjects should be impaired in this type of "conceptual" perspective taking ability (Baron-Cohen, 1988). This theoretical hypothesis would also predict that they should be impaired in referential communication as a result, if the link established by Roberts & Patterson (1983) holds true for the autistic population.

Baron-Cohen et al. (1985) cite support for their hypothesis based on results of a study where autistic, Down's Syndrome and normally developing children were compared on their ability to perform on a task where successful performance depended upon the child's ability to understand that different people can have different beliefs about a particular situation. The autisic group's mean mental age was substantially higher than either the Down's Syndrome or the normally developing group. Use of unmatched groups was undertaken deliberately to enable a stringent test of the notion that this deficit was specific to the phenomenon of autism and could not be attributed to the effect of mental retardation.

A puppet play paradigm, originally developed by Wimmer & Perner (1983) was employed. Two puppet dolls were used. Each was given a name and children asked to identify which was which. All subjects were able to correctly identify both dolls. One doll conspicuously placed a marble into a basket and then left the scene. While she was absent, the other doll moved the marble into a different spot. When the first doll returned, the experimenter asked the subject "Where will Sally (name of first doll) look for her marble?" A response scored as a pass would be for the child to point to the previous location of the

marble, based on Sally's belief, now false, that the marble had stayed where she put it. An incorrect response would be for the child to point to the new location, as that would indicate that the child had not taken account of the doll's false belief. To eliminate other possible reasons why the child might not point to the appropriate location, two control questions were also asked, "Where is the marble really?" and "Where was the marble in the beginning?" These two questions ensured that the child had both an accurate memory of the scenario and knowledge about the current location of the marble.

Results were striking. All children, without exception, passed all three control questions (naming, memory, and current location). On the question assessing false belief, substantial group differences were found. The vast majority of both Down's syndrome and normally developing children consistently passed the belief question, pointing to the previous location of the marble. In contrast, 16 of the 20 autistic children failed this item, leading to significant differences between the groups. Only the autistic children failed on this task, and those who did consistently pointed to the current real location of the marble. This eliminated the possibility of random pointing as an alternative explanation. In addition, a second trial where the location of the marble was switched, and where responses in all groups were consistent with their performance on the first trial, eliminated the possibility that incorrect responding came from any sort of position preference. Correct responses on the control questions suggested that those subjects who failed were not just being unco-operative. Having eliminated this series of alternative explanations, Baron-Cohen et al. (1985) posited strong support for their hypothesis that autistic children are unable to assess another person's beliefs, and by extension, their state of mind. These authors postulate that this consitutes a specific cognitive deficit in the autistic population. This defect would not be evaluated on current, standardized cognitive assessments and thus appears as independent of general intellectual level. Consequently, it would be specific to autism and not attributable to mental retardation.

While intriguing as a hypothesis, there are several criticisms that may be levelled at this study. First of all, there were four autistic children who succeeded in this task. They were shown to be comparable to the other subjects in terms of both mental and chronological age. To be utterly convincing, the specific developmental deficit in childhood autism should appear in all members of the diagnosed group. In order to be both necessary and specific to the phenomenon it must be present in both the high and the low functioning members of the group (Rutter & Schopler, 1987). Certainly 20% of the sample not exhibiting a behaviour posited to be the fundamental source of dysfunction in a diagnostic phenomenon is significant. Baron-Cohen and his colleagues (1985) acknowledged that this sub-group required further investigation.

Secondly, the sole measure for assigning verbal mental ages was the British Picture Vocabulary Test. This test is a receptive vocabulary measure and so while reasonable as an assessment of comprehension for selected lexical items, it is questionable as a means by which to assign reliable and valid verbal mental age scores. This particular criticism applies to much of Baron-Cohen's subsequent work in this area. Additionally, the British Picture Vocabulary Test does not assess comprehension of the type of complex syntactic constructions that are employed in the stimulus questions used in the study, thus making it at least possible that the autistic children did not understand the critical "false belief" question (Boucher, 1989; de Gelder, 1987).

Third, at the heart of the "theory of mind" hypothesis is a proposed deficit in "metarepresentation". According to Leslie (1987), this incapacity to form second-order representations, or a representation of another's representation (e.g. thoughts about another's thoughts, beliefs about another's beliefs), accounts for both the autistic child's lack of a theory of mind and his/her paucity of pretend play as documented by Ungerer & Sigman (1981) and Sigman & Ungerer (1984). Given this, the use of a pretend play paradigm, using dolls, seems questionable as a means to evaluate whether or not the autistic child is able to impute belief to others (de Gelder, 1987). In essence, the entry to the task is through a

previously established area of dysfunction. Concluding then that problems in performing a task entered thus are supportive of the existence of a common underlying deficit seems akin to asking a blind man to identify a shape presented visually and then concluding problems in spatial conceptualization based on his inaccurate response. Assessing the ability to impute belief might be better undertaken in a situation where the child was not required to first assume that an inanimate object actually thinks and feels.

An attempt to meet some of these concerns was undertaken when Leslie & Frith (1988) replicated the Baron-Cohen et al. (1985) findings using a different group of autistic subjects and real people instead of dolls, so the concern about using a pretend play paradigm may not apply. In Leslie & Frith's (1988) study, the control group was a group of specifically language impaired children in an attempt to achieve a better match in terms of language level than might be achieved with other control groups. The British Picture Vocabulary Scale was, however, still the instrument used as the instrument by which verbal mental age was evaluated. Its weaknesses in the assessment of syntactic level have already been discussed. Leslie & Frith concluded that the majority of autistic children (in their sample all but 5 of 18), even those within the normal range of intellectual ability, fail elementary levels of attributing mental states to others. In short, they suggest that specific problems arise in autistic people's ability to understand that a listener might not automatically share the same information as the speaker within a given situation. This would be a disorder in the first level of perspective taking as identified by Roberts & Patterson (1983). Despite the methodological tightening in this study, one still queries whether "conceptual" perspective taking would consistently be impaired in tasks not involving language, and thus unable to be complicated by linguistic impairment.

In a follow-up study in 1986, Baron-Cohen, Leslie & Frith used an original method of assessing the ability of autistic children to attribute beliefs to others and replicated their previous results. Using the same groups of autistic, Down's syndrome, and normally developing children, subjects were asked to sequence pictures into a meaningful story

sequence. Some of the sequences were relatively straightforward, e.g. showing a boy getting up in the morning, and gradually getting dressed with each picture depicting the addition of more pieces of clothing. The critical sequences, however, followed the doll and her marble scenario. For example, one showed a boy placing a chocolate in a box and then going out to play. A subsequent picture showed the boy's mother eating the chocolate with the last picture in the sequence showing the boy returning to look for the chocolate, falsely believing that it would still be in its original spot. In addition to the sequencing task, children were also asked to narrate the story. Again, significantly fewer of the autistic group, approximately 20% , were able to achieve success on the critical sequencing tasks. In addition, they were also shown to use significantly fewer mental state terms (e.g. "think", "know") in their narrations. However, while this study met some of the methodological concerns outlined above by not using dolls, and by not employing a question, it is still open to criticism because the same subjects were used as participated in the 1985 study and they could hardly be considered neophytes to this type of task or representative of the autistic population (Boucher, 1989). Again, one is struck by the 20% of the autistic group who did perform the task successfully.

In 1989b, Baron-Cohen attempted to address concerns regarding the proportion of his autistic subjects who were able to pass the critical false belief questions. Positing a specific developmental delay in metarepresentational ability, Baron-Cohen (1989b) suggested that older and/or higher functioning autistic subjects might at some point develop the elementary skills involved in the false belief tasks employed in the first study. Therefore, he recruited 10 autistic children who were able to complete the previous task and exposed them to a task requiring higher order representations. Instead of needing to know what one person thought about a situation, the task employed here required them to determine what one person thought about what another person thought (Mary thinks that John thinks that..). In this task, dolls were led through a toy village with the experimenter describing a scenario as the toys were manipulated. Questions were asked periodically to ensure that children were

following the story, understood the plot, and knew what the reality of the situation was so that confusion about the true state of affairs, or a deficient memory, could not be stated as responsible for errors in response. As the story unfolded, one of the characters was initially told, in the presence of the other character, that he could buy ice cream in the park all afternoon. However, after he had gone home, the ice cream man decided to move to another location. On the way, he saw the boy again and told him about the switch in location. By this time, though, the second character was not present. So, when she went to call on the first character and his mother reported that he had gone to buy ice cream, the stage was set for asking the critical false belief question "Where does Mary think that John has gone to buy ice cream". Correct answers would be based on Mary's false belief that John thought that the ice cream man had stayed in the original location. Following the child's answer to the belief question, (s)he was then asked to justify his/her answer (i.e. The experimenter asked "Why?"). On the belief task, the performance of the autistic group was significantly deficient compared to the controls, with none of the autistic group passing the critical false belief item, compared to 6 of 10 Down's syndrome children and 9 of 10 normal controls.

The additional data provided by the justification question showed that those subjects who succeeded at the belief task all gave reasons for their response that were consistent with the use of higher levels of representation (i.e. taking account of both character's beliefs, for example, "She doesn't know that the ice cream man talked to John"). On the other hand, those who failed gave responses that indicated the use of a lower order strategy, such as taking only one character's mind set (either John's or Mary's) into account (e.g "He knows the ice cream man is at the church"). Baron-Cohen (1989b) interpreted these responses as indicating the use of the more elementary level of perspective taking skill targetted in the 1985 study. Some subject's responses did not explicitly refer to either character's beliefs (e.g. "It [the ice cream van] is at the church"), and one of each of the Down's syndrome and the autistic group failed to respond to the justification question.

Baron-Cohen (1989b) suggested that these findings represented strong support for the notion that at some level all autistic people would be deficient in some aspect of metarepresentational development and that this constitutes a specific area of developmental delay within this population. Thus, in this article he acknowleged that "theory of mind" per se cannot be completely absent in these subjects evidenced by their ability to pass the first level task employed as a screening device and their answers to the justification questions. Instead he suggested that some autistic speakers might eventually achieve the basic level of attributing some measure of belief to another person, but would always exhibit disturbance in some higher level aspect of the skill. Therefore, he continued to suggest that this is an area of developmental delay specific to autism and in a subsequent article (1989d) reiterated that the theory of mind hypothesis was a reasonable explanation for the communicative impairments associated with autism.

Methodological criticisms may still be levelled in terms of the language tests employed as the mechanism by which mental age is established (British Picture Vocabulary Test, and Expressive One Word Picture Vocabulary Test). As mentioned previously, evaluations of lexical competence are not necessarily indicative of competence in sophisticated syntactic expression. In addition, in this study, 4 of the 10 autistic subjects, and the same number of the Down's syndrome group, were not tested on even these language measures, so no information is available about their skills. Further, in the reporting of results, Baron-Cohen (1989b) reveals that one autistic child failed all of the control questions, and one of the Down's syndrome subjects needed to be prompted. Neither of these subjects were excluded from the final results. This is a questionable practice especially as Baron-Cohen et al. (1985) point out that conclusions regarding disturbances in theory of mind are only warranted if all of the control questions are accurately answered. Finally, one wonders about the social behaviour found in this group of autistic subjects. If an impaired theory of mind is to account for the disturbances in social and communicative behaviour in the autistic population, the fact that these autistic subjects had a rudimentary form of theory of mind should have

enabled them to develop more sophisticated social skills than those of children without the fundamental behaviours. Unfortunately measures of this sort were not taken.

Boucher (1989) presented a comprehensive examination of the "theory of mind" hypothesis, reviewing both the evidence in its support as well as offering a critique of it as an explanation for the fundamental deficit in childhood autism. Boucher's assessment of the hypothesis is organized along three themes which she suggests to be central to the hypothesis. These themes are: 1) that autistic individuals demonstrate an impaired ability to attribute mental states to others, 2) that this impairment is a result of a specific developmental deficiency in higher order representational skills and 3) that this specific impairment will ultimately prove to be primary and fundamental to the phenomenon of autism and thus will not require any further behavioural explanation.

Some of her methodological criticisms in response to the first of these themes have already been cited in the review of Baron-Cohen et al (1985). However, one of her most salient points has not yet been addressed in this review. Boucher (1989) notes that Baron-Cohen and his colleagues (1985,1986, 1989b) appear to assume that failure of performance is likely attributable to a lack of ability. Instead, Boucher (1989) suggests that autistic children may well have the requisite skills to perform on the tasks, but not see the relevance of using them in a particular situation. In essence, she suggests that it is very likely that autistic children don't spontaneously attribute mental states to others, but is much less convinced that they can't. Evidence in support of this possibility comes from work done by Lewis & Boucher (1988) which contradicted the conventional wisdom that autistic children were unable to participate in pretend play. While it had been routinely assumed that observed differences in spontaneous pretend play activities in autistic as opposed to control groups indicated an inability to engage in it, Lewis and Boucher (1988) found that, if it was elicited (i.e. children given toys and asked to demonstrate what could be done with them), autistic children were as capable of pretend play as language matched controls. Thus, she suggests that attribution of mental states might also be a latent skill within relatively able autistic subjects. The current

investigation attempts to test this hypothesis by trying to elicit referential communication or perspective taking behaviour through the application of a prompting paradigm. If successful, these results would be interpreted as support for Boucher's position of an impairment in spontaneous use rather than an incapacity as posited by Baron-Cohen et al. (1985), Leslie (1987), and Frith (1989).

With regard to the second theme, whether or not an impaired ability to attribute mental states to others is caused by an impairment in representational ability, Boucher (1989) notes a circularity in argument presented by Baron-Cohen and his colleagues (1985). She observes that deficits in attributing beliefs to others are supposed to be explained by a general incapacity in metarepresentation. However, the only evidence in support of a generalized deficit in metarepresentation is found in tests of autistic children's difficulty in attribution of beliefs. As Hobson (1989) suggests, this is merely a redescription of the evidence. Tests upholding Baron-Cohen et al's (1985) hypothesis in areas requiring metarepresentation but not requiring attribution of mental states would be more convincing. The evidence regarding pretend play capacities is important in this regard, as this is one area in which attribution of mental states in not required but which does depend upon metarepresentational skill, according to Leslie (1987). In Leslie's model, pretend play calls for metarepresentational ability while functional play does not. Baron-Cohen (1987) claimed to have found this dissociation between pretend and functional play whereas Lewis & Boucher (1988) found contradictory results, as already outlined.

Baron-Cohen (1989a) suggests that some further evidence in support of impaired metarepresentational ability , independent of possible contaminating social factors, arises from studies carried out to investigate whether autistic children could distinguish between mental and physical phenomena and between the appearance of something as opposed to its reality. In one study, Baron-Cohen (1989a) asked autistic, mentally handicapped and normally developing children to identify both the location and the function of both the heart and the brain. All groups reliably identified the location of both organs. However, when asked

about the function, significant differences were noted. Most of the control group subjects reported some sort of mental function for the brain, (e.g. makes you think), while only 24% of the autistic subjects did. However, nearly 71% of the autistic subjects spontaneously referred to the brain's function in behaviour (e.g. "It makes you wake up and go to sleep"). This is particularly interesting as this type of response is generally regarded as more sophisticated than attributing mental functions. Thus, because almost a quarter of the autistic subjects identified mental functions and since almost three-quarters produced more complex answers than the control groups, one cannot conclude that autistic people are entirely unaware of the mental world. Nevertheless, Baron-Cohen (1989a) interprets this result as evidence that some difficulty in understanding mental phenomena is independent of general developmental delay, as it was significantly different from the performance of the mentally retarded group. It does not, however, address the issue surrounding incapacity versus a lack of spontaneous use.

In a subsequent experiment using the same subjects Baron-Cohen (1989a) attempted to assess the autistic child's ability to attribute mental states to oneself by evaluating whether or not autistic subjects could make reliable judgments about the perceptual appearance of an object in contrast to what it really is, or it's reality. In this process, children were given a warm-up procedure to illustrate the meaning of some key terms to be presented later. In the warm-up, the curtains to the room were closed and the light shut off. The experimenter explained that by doing so, it looked like it was night but it was really still daytime. Two questions were then asked, "Does it look like day or night?" and "What is it really?" Subsequently, the experimental task employed the same paradigm, where an object's colour, size, composition and identity were systematically manipulated. Each time, both an appearance ("What does it look like?) and a reality ("What is it really?") question were asked. Once again, the autistic group was significantly less able than control subjects to perform appropriately on the task, and Baron-Cohen interpreted these results as indicating that autistic children were unable to attribute mental states to themselves. However, one is

also led to wonder why they performed appropriately in the less structured but no less definitive warm-up procedure. In addition, they were consistently able to identify objects as "fake" , thus suggesting that they understood the notion of pretence which according to the proponents of the theory of mind deficit hypothesis should be beyond their scope.

In terms of Boucher's third theme, whether such a representational deficit, if reliably established, could be considered primary and fundamental to explaining autism's characteristics or whether it would itself be the result of impairment in some more elementary social and cognitive skills, Boucher (1989) argues for the latter. Support for her contention arises from several sources. De Gelder (1987) argues that a "theory of mind" is not a single cognitive mechanism and must, of necessity evolve out of social interaction, linguistic and conversational skill, as well as conceptual and representational abilities. In that case, a deficit in impaired metarepresentation in the autistic population could be the result rather than the source of other impairments. Hobson (1989) also supports this view of an impaired theory of mind as secondary in autism rather than primary, suggesting that a child's metarepresentational capacity arises out of, rather than forms the basis of, his or her understanding that human beings have mental states. The evidence for onset of autism even within infancy and the research previously cited about the communicative and interactional problems exhibited in the autistic population at a very early stage before children would be expected to have developed metarepresentational abilities also supports the notion that an impairment in the development of a theory of mind is not fundamentally responsible for the communicative deficits associated with autism. Therefore, while the notion of impaired development of a theory of mind has served to redirect the examination of autism's basic deficit, Boucher (1989) concludes that it is unlikely that this will prove to be the dysfunction that is central and fundamental to the disorder. The current investigations are also directed toward this issue by attempting to demonstrate that communicative problems can be reliably identified in the autistic population that are independent of perspective taking skill.

Loveland , Tunali, McEvoy & Kelley (1989), in the single study found in the literature dealing with referential communication skills in autistic speakers, suggested that their results supported the hypothesis offered by Baron-Cohen et al. (1985). Loveland et al. (1989) investigated the ability of high-functioning verbal autistic adolescents and verbal mental age matched Down's syndrome subjects to perform a specific referential communication task. Participants learned a simple board game and were then asked to teach it to a listener who used varying levels of prompting to elicit target information. Results indicated that high functioning verbal adolescents with autism and Down's syndrome differed in referential communication skills even when matched on verbal mental age. Although subjects for both groups were able to complete the task, most subjects in the autistic group required specific prompting in order to produce the targetted information whereas most of the Down's syndrome subjects did not. Loveland et al. (1989) interpreted these results as indicating that when the demands for a speaker to be aware of listener needs were reduced by increasingly specific prompts, autistic subjects were more able to perform successfully. Thus, they suggested that autistic speakers' difficulties might lie in sufficiently anticipating the listener's perspective in order to select the information that is both necessary and appropriate for adequate communication. According to Roberts & Patterson's (1983) framework, this would be a disorder in the second level of perspective taking skill and the specific level at which they were able to establish a connection between referential communication and perspective taking skills. Although Loveland et al's (1989) conclusions appear reasonable, their study included no direct measurement of perspective taking ability. Thus, no direct test of the suggested relationship between referential communication failure and second level perspective taking skill deficits was undertaken.

Research Questions

The research reported here attempted to systematically investigate the relationship between referential communication and perspective taking in the autistic population. Some evidence has been reviewed suggesting that autistic children experience difficulty in both

domains. Although the same relationship as was established for the normally developing by Roberts & Patterson (1983) is often assumed to exist in the autistic population (Loveland et al., 1989), it has not yet been empirically established. Until it is, conclusions attributing dysfunction in one area to deficiency in another seem unwarranted. The first study directed itself to this issue by replicating Roberts & Patterson's work of 1983 using that subset of autistic subjects who demonstrated ability to complete the first level perspective taking task. Although Baron-Cohen et al. (1985) and Leslie & Frith (1988) suggested these to be a minority, high functioning autistic children/adolescents should qualify due to the presumed developmental nature of this ability as demonstrated in Baron-Cohen et al.'s work of 1985 and 1989. Use of autistic subjects of normal or close to normal intelligence is also considered advantageous in attempting to isolate a deficit which is specific to the phenomenon of autism.

The second study extended the investigation by attempting to determine whether anticipated differences in performance occurring between autistic and matched control groups, represented a developmental deficiency (as suggested by Baron-Cohen et al. 1985) or a difficulty in application of existing skills (as proposed by Boucher, 1989) .

In the proposed study, these issues will be examined by asking the following questions: (1) In those autistic children who display rudimentary perspective taking skill, can specific referential communication ability be related to the second level of perspective taking skills in a manner similar to that demonstrated in the normal population by Roberts and Patterson (1983) and as suggested by Loveland et al. (1989)? In other words, having been screened to ensure fundamental perspective taking skill, would the autistic subjects still fail at referential communication tasks? If so, would that failure be related to failure in higher level perspective taking tasks assessed in the same context and using the same materials?

(2) In cases of referential communication dysfunction, could successful performance of the task be achieved by application of a prompting paradigm? If so, would successful performance be generalized to a novel set of stimuli? Results here would address the issue

of whether the autistic child is operating with a true disability or a disorder related to spontaneous use.

A secondary research concern was the issue of whether or not the deviant language noted in autistic speakers' expressive language performance was adequately explained by dysfunctional perspective taking and/or referential communication. Loveland et al. (1989) found, at their most general instructional level, that autistic subjects gave significantly more disorganized, repetitive, or ambiguous responses than Down Syndrome subjects who had been matched for verbal ability. That is, their expressive language could be described as qualitatively different, in terms of communicative effectiveness and efficiency, from that of their matched controls. However, as prompts became more specific, response adequacy between groups was no longer significantly different. Loveland et al. (1989) interpreted this as support for the notion that when autistic speakers cannot predict the listener's state of mind, they are unable to generate clear, informative messages. As situational structure was increased and the need to predict the listener's frame of reference diminished, the autistic child was more able to compose adequate, well-formed sentences. The implication is that if the demands of perspective taking were eliminated, the communication of autistic speakers would resemble the developmentally delayed language of the mentally handicapped child. However, the same type of qualitative differences were noted by Volden & Lord (1991) in the spontaneous speech of high functioning autistic speakers as compared to mentally handicapped and normally developing controls. In this case, they occurred in a poster/story description task where perspective taking ability would not seem to be required because the same stimulus was readily available to both parties. These results suggested that deviant expressive language was not solely attributable to deficiencies in perspective taking skill. Although the experimental tasks used in the current studies were intrinsically more structured and controlled than those in either of the above investigations, qualitative differences, as measured by indices of communicative efficiency (Meline, 1986) and discourse management skills (Pacci-Cooper et al., 1981; cited in Curcio & Paccia, 1987), were examined .

CHAPTER 3

Method

Subjects

As shown in Table 1, two groups of subjects were identified through the records of an autism clinic and through educational institutions in central Alberta. Following Roberts and Patterson's (1983) findings that most normally developing children succeeded on their referential communication and perspective taking tasks by the age of 5, subjects were selected who exceeded a verbal mental age of 5 years. Ten higher-functioning autistic (verbal IQ's > 80), and 10 normally developing adolescents and young adults served as subjects. Groups were matched for chronological age (CA) and sex (8 males, 2 females per group). Language skill was also a consideration. Verbal IQ (on WISC-R or WAIS-R; Weschler, 1974; 1981) was used as a general index of expressive and receptive communication skill for the autistic group and it was assumed that chronological age equalled language age for the normally developing subjects. Groups were selected to be similar in terms of verbal IQ and thus roughly equivalent in language level.

A group of lower-functioning (verbal IQ's < 80) participants was also sought, but largely not found. Younger or more mentally handicapped autistic subjects were generally unable to pass either the criteria of language skills at approximately the 5 year level or when tested, the screening tasks embedded within the experimental paradigm. Only three appropriate lower-functioning (verbal IQ's 70-79) autistic subjects were found. They were not matched to control subjects as there were too few to make reasonable comparisons. Their data were, however, considered in an attempt to informally assess their performance on the experimental tasks in comparison to the higher-functioning autistic group.

Table 1 - Description of subjects

Group		Chronological Age*	Verbal IQ
Matched Autistic	M:	18;8	94.9
(n = 10)	SD:	3;6	10.14
	Range:	13;6 - 24;4	81 - 111
Normal	M:	18;8	
(n = 10)	SD:	3;7	
	Range:	13;1 - 24;4	
Unmatched	M:	19	74.6
Autistic	SD:	5;10	2.08
(n = 3)	Range:	13;6 - 25;2	73 - 77

* Chronological age given in years followed by semi-colon, and then months.

The autistic group ranged in chronological age from 13 to 24 years. Each subject had been judged independently by a child psychologist and a child psychiatrist to have met DSM-III-R (APA, 1987) and ICD-10 (WHO, 1987) diagnostic criteria for autism. In addition, 8 of the 10 matched subjects had also been participants in a previous study by Volden and Lord (1991) and thus also met research diagnostic criteria for autism on the Childhood Autism Rating Scale (Schopler, Reichler & Renner, 1986) and as outlined in the Autism Diagnostic Interview (LeCouteur et al., 1989). Psychometric testing which had

been completed for a previous study was generally not repeated here because subjects were on the whole in late adolescence or young adulthood, and there seemed no reason to expect significant variation in their largely normal verbal IQ scores. Stability in verbal IQ measures of autistic subjects over longer periods of time was demonstrated by Lockyer & Rutter (1969) even for those who were more severely handicapped than any of the subjects in the present study. For those subjects who were in early adolescence (younger than age 15), and thus whose scores might normally be expected to vary, or whose previous testing had revealed verbal IQ measures less than 80, the WISC-R or WAIS-R (Wechsler, 1974; 1981) was re-administered as appropriate. In each of these cases, verbal IQ scores were very similar to results obtained in previous testing.

One of the autistic subjects wore bilateral hearing aids. As his performance on the experimental tasks was perfect, his data were not excluded. No other subjects demonstrated sensory or physical handicaps and none were chosen whose first language was not English. Normally developing control subjects were recruited from secondary and post-secondary educational institutions in central Alberta on the basis of chronological age and sex.

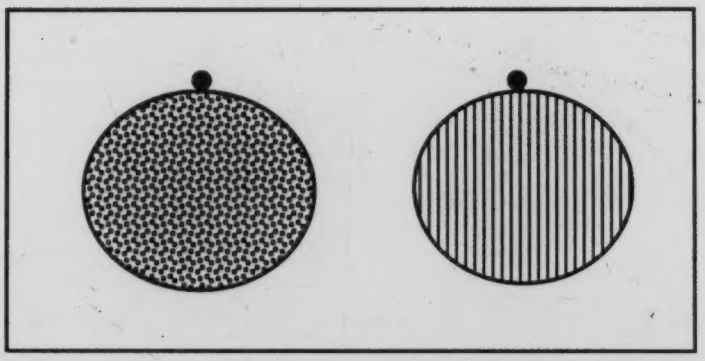
Experimental Setting and Materials

The experimental setting and stimulus materials were modelled after those described by Roberts and Patterson (1983). Subjects were tested in a quiet room, while seated at a table opposite an adult. This adult acted as the "listener" in both the perspective evaluation and referential communication tasks. For most subjects, the "listener" was a female graduate student. In two cases, a male post-doctoral fellow was employed as the listener. In all cases, if a subject returned for a second session, the "listener" used in that subject's initial session was used again. The principal investigator was also seated at the table, between the subject and the "listener".

Stimulus materials, for both referential communication and perspective taking tasks, consisted of pairs of identical cards, each with two potential referents. Potential

referents varied on four dimensions, with one of two possible attributes per dimension: colour (red or yellow), shape (circle or triangle), texture or pattern (striped or dotted), and position of a small black dot (top or bottom). On each card, the two referents were identical on three attributes and different on one. For example, one card had a red, dotted circle and a red, striped circle with a black dot at the top of each (See Figure 1) . Thus, on each card, referents could be differentiated by a single attribute. Across all pairs of cards, attributes from each dimension were balanced in their role as the distinguishing attribute.

Figure 1. Sample stimulus card.



General Procedure

Study One

The first study attempted to address the issue of whether or not referential communication and perspective taking were related in autistic people in the same way as Roberts & Patterson (1983) found them to be in the normal population. A second question concerned whether or not anticipated group differences in both skills could be established. To answer these questions, the general procedures (two screening and three experimental tasks) used by Roberts & Patterson (1983) were employed. This study will also be referred to as the "unprompted condition".

The first screening procedure ensured that all subjects could label each of the attributes used. On practice stimuli, each was asked to label each of the attributes (e.g. "What colour is this?", "What shape is this?" etc.). Only those who correctly and spontaneously labelled all of the attributes were included as subjects. Of the 16 autistic subjects selected with verbal mental ages greater than or equal to five years and tested on this task, only three failed to proceed. These three failed not because of a simple mislabelling of the attributes but because they were unable to maintain attention to the task.

A second screening procedure was embedded within the administration of the first two experimental tasks (referential communication and perspective taking). For these, task set up was identical. A stimulus card was placed on the table in front of the subject, an identical one placed in front of the listener, and the subject's attention drawn to the fact that the stimulus cards were identical. A small, opaque divider was then placed between the child and the listener so that neither could see the other's card. The experimenter then placed a small marker next to one of the two potential referents on the subject's card and informed the subject that the one so indicated was "the secret one". The second screening procedure was designed to assess whether the subject had preliminary perspective taking abilities sufficient to understand that (s)he possessed some information unavailable to the listener, and was seen as pre-requisite to any subsequent perspective taking evaluation. The principal investigator asked subjects the following questions, in random order, prior to the first three trials of each of the referential communication and perspective taking tasks: "Do I know which one is the "secret" one?" "Does [name of listener] know which one is the "secret" one?" "Do you know which one is the "secret" one?" If subjects did not respond correctly , i.e. that only the listener was unaware of the referent's identity, they were excluded from the study. No subjects were excluded on this basis.

Task Instructions

In the referential communication task, the subject was instructed to tell the listener "which one is the secret one... so (s)he can pick it out on his/her card". Responses were recorded on video tape, transcribed by the listener, and simultaneously scored by the examiner.

For the perspective evaluation task, after the marker had been placed beside the referent, the experimenter instructed the subject to listen carefully and then proceeded to communicate a standard series of messages to the listener. The subject was required to evaluate the listener's perspective after each message by deciding whether or not the listener now had sufficient information to determine the identity of the target referent. On each trial, the experimenter would produce from one to four messages. After each message, the subject was asked, "Does [name of listener] know which one is the secret one now? Could he/she pick it out yet?"

The first message always contained one attribute (e.g., "It's yellow."). The second consisted of the first attribute plus one more (e.g., "It's yellow and dotted."). One attribute was added to each subsequent message until the subject indicated that the listener had sufficient information or until all four attributes had been communicated. Across the eight trials, the distinguishing attribute was communicated first, second, third, or fourth equally often.

The third task was the comparison task. Here, the subject was presented with a single stimulus card, and then was asked "What makes these two different?" For each of the three sets of experimental tasks, there were two practice trials followed by eight experimental trials. Each trial used a different stimulus card.

A sample transcript illustrating the interactional flow of Study One is included in Appendix A.

Order of Tasks

Roberts and Patterson (1983) indicated that administration of the comparison task before the others led to some difficulties in their pilot testing in interpretation of group responses. Therefore, they used two different counterbalanced orders of task presentation with the comparison task always given last. Order one involved the referential communication task first, then the perspective evaluation, and finally the comparison task. In order two, the perspective evaluation task was administered first, followed by the referential communication and comparison tasks. Although there was some possibility that practice effects would produce inflated scores on the comparison task because it was always presented last, Roberts & Patterson (1983) tested an independent group of children on the comparison task alone and found no significant differences in performance. Therefore, they concluded that practice did not exert a significant influence on achievement in this task. For these reasons, the same task orders were used in this investigation.

Specific research hypotheses were as follows: Autistic children were expected to perform as well as their matched controls on the comparison task. Ability to make the appropriate comparisons is viewed as necessary but not sufficient for skilled speaker performance. Although deficiencies have been reported in some aspects of referential communication, there has been no suggestion in the literature that autistic children have a specific impairment in this underlying area.

A strong relationship was predicted between subject performance, within diagnostic groups, on the referential communication and perspective evaluation tasks. As the stimuli involved are designed to be relatively simple, normally developing participants were expected to display strong performances on both tasks. On the contrary, as predicted in the literature, autistic subjects were predicted to demonstrate poor performance on each. So, while performances between tasks were expected to be strongly related within diagnostic groups, between groups differences in performance

were expected with the autistic group anticipated to perform significantly less well than matched normal controls.

Study Two

The purpose of the second study was to assess, in the event of errors, whether or not success could be achieved in either or both of the referential communication and perspective taking tasks by administration of a brief prompt. The second question here was whether or not this improved level of performance would generalize to novel stimuli. Study Two involved two conditions, the first called "prompted" and the second labelled "generalization".

The second study involved only those subjects who exhibited poor performance on the referential communication or the perspective taking experimental tasks. Consistent with the Roberts & Patterson (1983) study, poor performance was defined as six or less "contrastive" messages on the referential communication procedure or as a score of six or less on the perspective evaluation task. For each task, there was a total of eight items. A "contrastive message" was defined as a message containing only the attribute that distinguishes the designated referent from the other shape on the card. On the perspective taking task, a score of one was awarded when subjects indicated that the listener became informed of the referent's identity immediately after the distinguishing attribute was communicated, regardless of which message in the sequence of four contained the critical element. For example, the distinguishing attribute was communicated first, second, third, or fourth equally often. A score of one was given if, and only if, the subject responded with a "yes" or equivalent answer following the message which included the distinguishing attribute. If an affirmative response was given at any other time, no points were awarded for that item.

This study was conducted on a subsequent day to Study One, using the same experimental setting. For the first phase, or what will be called the prompted condition,

the same stimulus materials as were previously described for Study One were used. Stimuli were presented in a different order and the distinguishing attribute was changed from the one used in the unprompted condition. The purpose here was to determine whether or not the subject's performance on either or both the referential communication and perspective evaluation tasks could be improved by application of a prompting paradigm. Because the tasks could no longer be considered unfamiliar, items initially designated as "practice" were included with those originally termed "experimental" in the analysis. Thus, instead of 8 trials, each task was composed of 10 items. As in Study One, attributes from each dimension were selected as differentiating the target referent from the foil equally often. Similarly, in the perspective taking tasks, the message containing the distinguishing attribute was given first, second, third or fourth equally often across the two conditions of Study Two.

Once a subject was admitted to the second study, all three experimental tasks were administered. Perfect performance on any of the tasks in the unprompted condition, or Study One, did not preclude re-administration of the task if a subject was included within the second study.

The prompting paradigm consisted of an adaptation of the comparison procedure with explicit, direct instructions given about how to proceed. For example, the referential communication task began as outlined in the first study. Both the subject and the listener were given identical stimulus cards, then a small opaque barrier was placed between them and the experimenter placed a small marker beside one of the two potential referents on the subject's card, saying "This is the secret one." The subject was then instructed to tell the listener which one of the two referents was the target. However, if the subject's message was not "contrastive", that is including only the attribute that distinguished the target referent from the other potential referent, then explicit feedback was given. Feedback took the form of "What makes this one (the target referent) different from the other one? That's what (s)he needs to know. Tell him/her that." Prompts were only given

once per trial. If the subject's response was still "redundant" or "uninformative", the experimenter proceeded to the next item.

Prompting of the perspective evaluation task was similar. Again, the task began as outlined in the first study. Following placement of the marker to select the target or "secret" referent, the experimenter began to give messages of varying informational adequacy to the listener, asking the subject to judge the listener's perspective after each message. Upon receipt of an incorrect response, either a judgment of "no" when , in fact, sufficient information had been provided or "yes" when the message was inadequate, the prompt was administered. In the first case, the subject responding "no" when the message given the listener was indeed adequate, the prompt was "No. What makes these two different? That's what (s)he needs to know. I told him/her that." In the latter case, if the child responded "yes" to a situation where the message was inadequate, the prompt was the same except its last sentence was changed to "I didn't tell him/her that". Minor variations in wording were sometimes employed, but the essential nature of the prompt remained the same. Once the prompt was given, the experimenter went on to the next trial, and that stimulus item was re-administered following the initial presentation of all items. If, for any item, the prompt was required, the response following its administration was the one counted as the score for that item.

In Study Two as in Study One, the two tasks were presented in a counterbalanced order. For half of the subjects, the referential communication task was administered first using prompts if necessary, followed by the perspective evaluation task. For the other half, the task order was reversed. The comparison task was always last.

The next phase of Study Two was conducted immediately following completion of the prompted condition. Task set up and experimental conditions were identical to those already described except that novel stimuli were used. Stimulus materials again consisted of pairs of identical cards, each with two potential referents. Potential referents again varied on the same four dimensions, with one of two possible attributes per

dimension: colour (blue or orange), shape (square or heart), texture or pattern (wavy, horizontal lines or straight, diagonal stripes) and position of a small black triangle (inside or outside of the figure). As before, referents on each card were identical on three attributes and different on one.

For this study, the labelling task was again used as a screening measure prior to administration of the experimental tasks. Each child was asked, on practice stimuli, to label each attribute. All children spontaneously and correctly labelled all attributes and thus were allowed to continue.

Following the screening measure, the referential communication task was administered exactly as described for study one. Prompts were not given in the event of "non-contrastive" messages. The purpose here was to determine whether successful performance as trained in the prompted condition would transfer to a similar set of circumstances, without the benefit of further instruction.

Here, research hypotheses predicted that autistic subjects could indeed perform more successfully when given specific prompts about the nature of the information needed for clear communication, and, consistent with the proposal of Boucher (1989), that improved performance would be maintained when they were exposed to novel stimuli.

Dependent Measures and Scoring

For both studies, the dependent measures and scoring procedures are the same. Subject's scores on the experimental tasks were obtained from data recorded by the principal investigator, during the experimental sessions. Inter-rater reliability throughout the studies was determined by comparing the data generated by the principal investigator to that generated by one of two trained researchers blind to the diagnoses of the participants and the purposes of the studies. The following formula was used: Number of agreements / (Number of agreements + number of disagreements) and the result multiplied by 100 to obtain a percentage. For experimental task scores, an inter-

rater reliability of 92.98% across all tasks was achieved between the ratings of the principal investigator and the independent rater on her viewing of 10 randomly selected videotaped interactions.

On the referential communication task, each of the child's responses was classified into one of three categories: (1) "contrastive" - a message including only the attribute that distinguished the target referent from the potential referent, (2) "redundant" - a message including both the distinguishing attribute and at least one other, non-distinguishing attribute, or (3) "uninformative" - a message that did not include the distinguishing attribute (Whitehurst & Sonneschein, 1978, cited in Roberts and Patterson, 1983). Each subject thus received a profile of up to three scores for the referential communication task, depending on how many messages fell into each category. A score of six or less "contrastive" messages qualified a subject for inclusion in the second study.

As previously described, a correct performance on the perspective evaluation task was credited when subjects indicated that the listener became informed of the referent's identity immediately after the distinguishing attribute was communicated, regardless of the position of that attribute in the message sequence. For example, if the message containing the distinguishing attribute was the third one, the subject received credit if, and only if, (s)he responded in the negative to messages one and two and in the affirmative following the third message given. Only one score was obtained for this task and it ranged from zero to eight depending on the number of trials on which the correct pattern of answers was obtained. Again, a score of six or less qualified the subject for inclusion into the second study.

For the comparison task, a correct response consisted of identifying the single attribute on which the two potential referents differed. In essence, a correct response here contained the same information as a "contrastive" response on the referential

communication task. A single score was obtained, ranging from zero to eight depending on the number of trials on which the correct answer was given.

Transcription and Coding Procedures

Written records of the subjects' responses were produced by the principal investigator from the videotaped recordings of the interaction. These transcriptions were compared for accuracy with those of a trained independent transcriber blind to both subject diagnosis and the purposes of these studies. Inter-rater word by word reliability for transcription of subject's responses on 10 randomly selected videotapes was computed to be 97.5% using the following formula: Number of agreements / (Number of agreements + number of disagreements) x 100.

Following scoring of the experimental tasks, transcripts of the videotapes were examined independently by the principal investigator and the researcher noted above in order to identify features of particular interest. The purpose here was to examine subjects' verbal output to assess whether differences in communication could be identified that were not reflected by the scores on the experimental tasks.

Several measures were identified, falling into three general groups: communicative efficiency (Meline, 1986), discourse management skills (Paccia et al., 1981; cited in Curcio & Paccia, 1987), and presence of idiosyncratic features (Volden & Lord, 1991). To assess communicative efficiency, the referential communication task responses were chosen as they afforded the most opportunity for connected speech or sentence production. Efficiency ratings were derived from an examination of the mean number of words used in completing the referential communication task in each of the three scoring categories (contrastive, redundant, uninformative) which were taken as general indices of effectiveness. For example, for responses that were optimally effective or contrastive, the mean number of words used to express those contrastive responses was calculated for each group and used as a index of communicative efficiency for the "contrastive" effectiveness level.

Because the number of words needed to communicate each attribute was not equal (e.g. "It's red" is considerably shorter than "It has a black dot on the top".), an additional measure of efficiency was calculated. When subjects' were redundant, i.e. when they included more than the distinguishing attribute in their referential communication message, the average number of attributes (two, three or four) given within the redundant response was also calculated. For example, one subject's redundant response to an item where the distinguishing attribute was colour might be "It's red and it has a black dot on the top" while another might say "It's red and it's dotted and it's a circle". In terms of the number of words used, the second response would be marginally more efficient. However, in terms of the number of attributes included in the message, the second message is actually less efficient than the first as it gives three of the four possible attributes rather than two.

Further, the complete transcripts were coded for additional features of interest such as the presence of idiosyncratic language or inappropriate discourse management skills. Any subject utterance containing information not directly relevant to the task was flagged. Flagged utterances were subsequently coded by the principal investigator into the following categories:

a) Non-task related utterances: Any utterance that was totally unrelated to the completion of the task or the experimental situation. For example, asking what was the source of a noise outside in the hall, or a comment such as "Did you know that a zebra is something like a horse?"

b) Semi-task related utterances: Any utterance that was related in some way to the task, or to the notion of tasks in general, but not germane to the adequate completion of the task at hand. For example, asking how much longer the procedure would take, or commenting that tests like this were fun. Utterances querying specific aspects of the task like "Should I start now?" were considered appropriate and not coded.

c) Odd or unusual utterances: Any utterance which the reader considered to be odd, either in its structure, or by idiosyncratic or unconventional use of words or phrases, or by being pedantic, or socially inappropriate in a way that was unaccounted for by the other two categories. Examples of utterances receiving this code follow: "One's gone dotty on me" used to describe a target referent distinguished by a dotted pattern, "It's just one set of clue" versus the syntactically correct "clues", and the vaguely meaningful but nonetheless odd, "I like showing people how smart I really am, and what they think of me" An example of an utterance judged to be pedantic is the following description of the target referent as "...a unilateral triangle with a black dot running straight along the point from the apex to the centre of the base, lined with vertical stripes". As this was a very structured situation which was clearly meant to be examiner controlled, utterances judged to be socially inappropriate by virtue of their inappropriate directiveness were also coded in this category. An example is one subject telling the examiner to "Just forget the "yes" and "no" questions." when he tired of the screening task. Examples of utterances assigned to each category and their respective codes, organized by individual subjects, are given in Appendix B.

An utterance could conceivably be coded in more than one of the categories listed. For example, "Well, if you just simply point at her I get the drift which is if you just simply point at it, then she wouldn't know" was coded as both "semi-task related" and "odd" when it was offered spontaneously by a participant following administration of one of the perspective taking items. Inter-rater reliability was calculated as previously described and for all codes was determined to be 81.98% on a code by code basis on 10 transcripts selected at random. Disagreements were resolved by discussion and/or reviewing the original videotapes to assess whether discrepant ratings might be the result of the influence of context upon the prinicipal investigator's scores. In all cases where such a review was undertaken, the more liberal codings of the examiner were judged to have resulted from impressions gained within the communicative context (e.g. from facial

expressions, gestures etc) and thus they were retained and used in the analysis. Videotapes were not used for the original reliability checks on this dimension as judgments here required more subjective opinion than those in either the transcription reliability or the experimental task scoring reliability checks and some videotaped interactions included idiosyncratic or bizarre behaviour and/or unusual physical appearances that might have biased an observer in terms of determining a subject's diagnosis.

In response to the secondary research concern outlined above, no matter what their level of accurate performance on the referential communication or perspective taking tasks, qualitative differences, as measured by gross indices of communicative efficiency and discourse management skills, were predicted in the expressive language employed by the autistic group in speaker performance tasks when compared to age matched and equivalent language level controls.

CHAPTER 4

Results

Preliminary Analyses

Referential communication task scores in the initial unprompted condition, or Study One, were compared across task order within each group to determine whether or not task order had any effect. Mean contrastive scores of 1 and 4.8 across the two task orders in the matched autistic group were not significantly different (t (8) = 1.87, n.s.). In the normally developing control group, mean contrastive scores of 3 and 6.5 in task orders one and two respectively were also not significantly different (t (7.25) = .837 , n.s.) (Degrees of freedom not expressed as whole numbers result from their computation using the Welch formula (1938, cited in Hinkle, Wiersma & Jurs, 1979) suggested as an adjustment when comparing mean differences in cases of unequal variance) . Consequently, results obtained in either task order were considered together in all subsequent analyses.

Task order effects were not assessed in Study Two for two reasons. One, any biasing effect should have its greatest impact when the tasks were unfamiliar. Since this proved non-significant, it was unlikely that order of task presentation would be influential at a later point. Additionally, though within each condition half the subjects received each task order, randomized task order presentation coupled with the reduced number of subjects in Study Two, yielded very few participants with identical patterns of task order presentation across the three conditions of both studies. For example, one subject could have received task order one in Study One, followed by task order two in the prompted condition of Study Two and task order one again in the generalization condition, whereas another might have been given task order one first, followed by task order one again in the prompted condition and task order two in the final phase. Since not every subject proceeded to the second study, there were fewer subjects available for comparison across the two studies. Thus, identification of suitable groups in order to make reasonable comparisons based on identical exposure to specific task presentation orders across the three conditions yielded such small

sample sizes that comparisons of average performance as a function of task order history were meaningless.

Study One

As indicated previously, due to subject selection criteria, referential communication and perspective taking scores were expected to be near perfect in the normally developing control group. In Study One, where tasks were first administered and no prompt was given, this expectation was met for the perspective taking task where all 10 subjects achieved perfect scores. Performance was more variable on the referential communication measure. A mean of 62.5% were completed with "contrastive" (i.e. containing only the distinguishing attribute) or optimal responses. For the normally developing control group, when messages communicated to a listener were not "contrastive", they were always "redundant" (i.e. including at least one other attribute in addition to the differentiating one). No instances of uninformative responding (responses that did not include the distinguishing attribute) occurred.

The autistic group was expected to exhibit depressed scores on both referential communication and perspective taking tasks, but the relationship between scores achieved on referential communication and those obtained on the perspective taking measure was expected to be significantly positive. In other words, the experimental hypothesis of the first study proposed that the autistic subjects would be less able than their equivalent language level controls to perform on the experimental tasks, but that the two abilities would be related similarly in both populations. Contrary to expectations, the autistic group displayed near perfect performance (exhibiting a mean of 87.5% responses) on the perspective taking measure, making calculation of a correlation co-efficient of the relationship between the referential communication and the perspective taking tasks ill advised due to insufficient variability in the scores. Because formal measures of correlation were not calculated, the first experimental question posited in the first study remains unanswered. While referential communication and perspective taking appear to be related, close to ceiling performance

levels on the perspective taking task made reliable statistical confirmation impossible in the current study.

Informal evidence of some relationship between perspective taking ability and referential communication skill may be taken from an examination of the data from the three unmatched autistic subjects, shown in Table 2. As measures of central tendency are less informative as sample size decreases, data from the unmatched autistic group are given in raw scores. Two of the three exhibited minimal perspective taking skill (one achieved a score of 37.5%, and the other a score of 0) and the same two were the only subjects to give "uninformative" responses (50% and 75% respectively) in the referential communication task. The third subject in this group achieved a score of 100% on the perspective taking measure and employed "contrastive" responses on 87.5% on the referential communication task.

As shown in Table 3, on the referential communication task, the members of the matched autistic group used "contrastive" responses an average of 36.25% of the time . Like their matched controls, where referential communication responses were not "contrastive", they were always "redundant". No instances of "uninformative" responding occurred. Contrary to expectations, there were no significant differences between mean "contrastive" scores for the autistic and their matched control subjects ($\underline{M}$ = 62.5%) on performance in the referential communication task (t (18) = 1.38, n.s.).

Table 2 - Experimental Task results of the unmatched autistic group (in per cent)

Study 1

(Unprompted)

Subject	Referential Communication			Perspective Taking	Comparison
	Contrastive	Redundant	Uninformative		
M. E.	87.5	12.5	0	100	100
E. S.	0	50	50	37.5	100
C. P.	25	0	75	0	100

Study 2

(Prompted)

Subject	Referential Communication			Perspective Taking	Comparison
	Contrastive	Redundant	Uninformative		
E. S.	10	30	60	70	100
C. P.	100	0	0	0	100

Study 2

(Generalization)

Subject	Referential Communication			Perspective Taking	Comparison
	Contrastive	Redundant	Uninformative		
E. S.	0	60	40	40	100
C. P.	40	0	60	20	100

Scores on the third experimental task, the comparison measure, were uniformly perfect across all subjects and in all conditions. As the purpose of this task was primarily to ensure that any difficulty in referential communication or perspective taking performance could not be attributed to disturbances in the ability to make comparisons, this level of achievement was not surprising given subject selection criteria. Subjects were chosen who, according to Roberts and Patterson's data (1983), should reasonably be expected to complete the task accurately. Data from this task were, therefore, not included in subsequent analyses.

Table 3 -Unprompted condition task results (in per cent) by diagnostic group

Group		Study 1 (Unprompted)	
		Referential Communication*	Perspective Taking
Autistic	M:	36.25	87.50
	SD:	45.80	19.54
	Range:	0 - 100	37.5 - 100
	n:	10	10
Normal	M:	62.5	100
	SD:	39.03	0
	Range:	0 - 100	0
	n:	10	10

*Only the contrastive percentage scores are reported for the referential communication task.

Table 4 illustrates a person by person analysis of autistic subject performance on the referential communication and perspective taking tasks on Study One organized by task order. While no statistically significant differences were found in mean performance on either task between the two orders, it was felt that a person by person analysis might reveal trends in the data that could otherwise be obscured by an exclusive focus on the means. Inspection of the raw score results in Table 4 reveals an apparent trend toward contrastive performance on the referential communication task if the perspective taking measure was administered first. This runs contrary to the results found by Roberts & Patterson (1983) where the second task order was shown to exert a significant influence toward redundant responses in referential communication. In Roberts & Patterson's work (1983), these results were explained by positing that children imitated the examiner's behaviour of giving redundant messages in the perspective taking task. Even so, the predicted relationship between referential communication and perspective taking that was the major focus of Roberts & Patterson's work was not obscured by these task order effects. Contrastive referential communication and perspective taking performance were still shown to be correlated. In the current study, not only were statistically significant differences not demonstrated, but the apparent trend evident on examination of the raw scores does not run in the direction that would be predicted by explanations such as learning or imitation of the examiner's behaviour.

Table 4 - Referential communication and perspective taking raw scores on Study One by task order.

Task Order One - Referential communication followed by perspective taking

Subject	Referential Communication			Perspective Taking
(Matched)	Contrastive	Redundant	Uninformative	
1	0	8	0	8
2	0	8	0	8
3	3	5	0	6
4	2	6	0	8
5	0	8	0	7
(Unmatched)				
1	7	1	0	8

Task Order Two - Perspective taking followed by referential communication

Subject	Perspective Taking	Referential Communication		
(Matched)		Contrastive	Redundant	Uninformative
1	7	0	8	0
2	8	8	0	0
3	7	8	0	0
4	8	8	0	0
5	3	0	8	0
(Unmatched)				
1	0	2	0	6
2	3	0	4	4

In summary, Study One was designed to evaluate the relationship between referential communication and perspective taking skills in the autistic population and compare that to the relationship between the same skills found in the matched control group. Contrary to expectations, both groups performed at or near ceiling on the perspective taking task. Due to insufficient variability in the scores on this measure, formal measures of correlation between referential communication and perspective taking skill were not calculated. Thus, the extent of the relationship between these two abilities in the autistic population remains to be established. Although there was more variability in performance on the referential communication measure, there were no significant differences in optimal performance between the two groups. This was also contrary to expectations as the autistic group was expected to perform significantly less well than normal controls on both the referential communication and the perspective taking tasks. Results of the comparison task were as expected. Perfect performance by both groups was predicted.

Study Two

Five of the 10 normally developing subjects qualified for inclusion into the second study by exhibiting fewer than six "contrastive" responses on the referential communication task in study 1, while 7 of the 10 subjects with autism were included. As the tasks could no longer be considered unfamiliar, all 10 items were considered scorable in both phases of the second study. Phase one involved administration of a brief, direct prompt in cases where less than optimal responding occurred, and will be referred to as the prompted condition. The second phase, called the generalization condition, employed different stimulus materials in the same three tasks, in an attempt to assess whether improved performance levels would generalize to novel stimuli.

Table 5 - Task results (in per cent) for those who participated in both studies across condition by diagnostic groups

Group		Study 1 (Unprompted)		Study 1 (Prompted)		Study 2 (Generalization)	
		Referential* Communication	Perspective Taking	Referential Communication	Perspective Taking	Referential Communication	Perspective Taking
Autistic	M:	8.93[a**]	83.92	85.70[b]	98.57	71.40[b]	95.70
n = 7	SD:	15.67	22.49	25.07	3.78	30.44	7.87
	Range:	0 - 37.5	37.5 - 100	40 - 100	90 - 100	20 - 100	80 -100
Normal	M:	27.5[a]	100	100[b]	100	100[b]	100
n = 5	SD:	18.54	0	0	0	0	0
	Range:	0 - 50	0	0	0	0	0

*Only the contrastive, or optimal percentage scores are reported for the referential communication task.

** Different letters indicate significantly different conditions within groups based on t-tests for dependent groups. Levels of significance were at the .001 level except for the comparison between the unprompted and the generalization condition in the autistic group where the probability was < .01.

As shown in Table 5, in the prompted condition, perfect scores on the perspective taking measure were achieved, without the administration of any prompts, by the normally developing control group subjects. The autistic subjects achieved a mean prompted performance on this task of 98.57%, with two of the seven subjects requiring some prompts. A single prompt was sufficient for the first of these while the other participant required eight prompts to achieve perfect scores. No significant between groups differences in average performance were found on this task.

On the referential communication task, three of the five normally developing subjects spontaneously used "contrastive" responses and thus were never provided with a prompt. The other two required minimal prompting to achieve a perfect score of 10. Performance of the subjects with autism was, again, more variable on the referential communication measure within the prompted condition. While two of the seven followed the dominant pattern of the control subjects by spontaneously giving "contrastive" responses and thus not providing the examiner with the opportunity to administer a prompt, five participants made errors which required prompting. Three of these five only required a single prompt to boost their "contrastive" response score to 10. The remaining two required four and eight prompts respectively and were still unable to manifest perfect scores.

As illustrated in Table 5, mean percentages of "contrastive" responses obtained in the unprompted condition of the first study were compared to the average percentage of "contrastive" responses in the first phase of Study Two and were found to be significantly improved in the group with autism following administration of the prompt (t (6)= 8.465, $p < .001$). The control group also displayed significant improvement in the transition to the prompted from the unprompted condition (t (4) = 8.745 $p < .001$). Because the prompt chosen was explicit and direct ("What makes these two different? Tell her that."), making successful performance following its administration very likely, this result is not surprising. Between groups mean differences in "contrastive" responding in the prompted condition

were not significant (t (6) = 1.5, n.s.). Again, due to the direct nature of the prompt, this is not surprising.

A more interesting finding arose when the total number of prompts administered were considered. Of the 27 prompts administered, only three were provided to the five normally developing subjects while 24 were required for the seven members of the autistic group. A binomial test assessing the hypothesis that for equal groups prompts should be distributed equally revealed the observed distribution of prompts to be highly significant ($p < .01$).

Generalization of performance was assessed in the second phase of Study Two. As shown in Table 5, the normally developing control group responded optimally across all tasks. Subjects with autism maintained perfect performance on the comparison measure, and near perfect achievement on the perspective taking task (mean 95.7%). On the referential communication task, the mean number of contrastive or optimal responses was 71.4%. Between-groups comparison of "contrastive" responding approached significance for this condition (t (18) = 2.306, $p < .06$). On subsequent one way (by diagnostic groups) analysis of covariance using the unprompted referential communication contrastive scores as the covariate, no significant differences were found (F (1,9) = 1.512, $p < .25$, n.s.). Table 5 shows the results of t-tests for dependent groups comparing average percentage of "contrastive" responses across experimental conditions for those autistic subjects who were involved in both studies. Significant improvement from the unprompted condition of the first study (M = 8.93%) to the generalization phase of the second (M = 71.43%)(t (6) = 5.278, $p < .01$) was exhibited. The same comparison (M = 27.5% in unprompted, 100% in generalization) for members of the control group also revealed significant improvement (t (4) = 8.75, $p < .001$). While superficial examination of these results might suggest that administration of the prompt was responsible for the improvement noted, the minimal number of prompts required for the normally developing control subjects indicates that prompting served more to highlight valued performance criteria rather than engendering significant development of a new skill.

Additional analysis of those autistic subjects who continued to exhibit redundant responses in the generalization condition was undertaken to determine whether or not any improvement had occurred. Of the five matched autistic subjects who continued to display redundancies in their referential communication messages, three succeeded in reducing their redundancy by including, on average, fewer attributes than they had originally included in the unprompted condition. Means of 4.0, 2.5, and 3.625 attributes per redundant response were reduced to 2.0, 2.0 and 3.0 respectively. The two subjects who didn't demonstrate improvement here were minimally redundant (i.e. including only two attributes in redundant messages) in both conditions. Thus, not only was the frequency of redundant messages decreased, but the quality of the remaining redundant messages improved.

Study Two was designed to assess whether or not performance could be improved on tasks where errors were exhibited by administration of a brief prompt, and then to evaluate whether anticipated improvements in performance would generalize to novel stimuli. In general, both proved to be true. Referential communication performance improved from the unprompted condition of Study One to the prompted condition of Study Two. Perfect performance was maintained by the control group in the generalization condition with the administration of three prompts in total. Improved mean performance was also demonstrated within the autistic group though not with the same degree of consistency and following the administration of several more prompting episodes.

Additional Analyses

The verbal output of both groups was also examined in an attempt to evaluate qualitative differences in language skill between the groups. Despite their similar performances on the formal indices used to assess referential communication and perspective taking skills, the presence of reliable and significant differences in communication illustrated the subtle yet pervasive language disturbances that are central to the phenomenon of autism, particularly in the domain of pragmatic language use.

As previously mentioned, communicative efficiency was considered as one possible index of pragmatic dysfunction. One type of communicative efficiency rating was derived from an examination of the mean number of words used in completing the referential communication task at each of the effectiveness levels. While most means, on inspection, appeared similar, the effectiveness level that offered the most promise for demonstrating group differences was the "redundant" level with group means of 7.5 words per redundant response for the normally developing control group and 17.36 words per redundant response for the autistic group. As shown in Table 6, when these two efficiency ratings were compared, they were not significantly different (t (6.742) = 1.29, n.s.). An explanation may be found in a stem-leaf presentation of the data (see Figure 2). The presence of two substantially greater mean verbal output scores in the autistic group influenced superficial analysis of the mean scores (with the mean verbal output of the autistic group more than double that of the control group). In addition, average verbal outputs of 61.13 and 22.75 words per redundant response exhibited by two members of the autistic group were sufficient to create a lasting perception of verbosity even though the two groups were similar overall.

On a second efficiency measure, an examination of redundant responses (i.e. including the differentiating attribute and at least one other in their referential communication description, revealed that significantly more participants with autism (4 of the 10 autistic subjects versus none of the 10 control group subjects , Fisher's exact probability =.043) used three or four of the attributes in their referential communication descriptions in the initial unprompted condition. In other words, in cases of inefficiency, more members of the experimental group were less efficient (i.e. more redundant) than members of the control group.

Figure 2. Back to back stem-leaf display of average verbal output when redundant by diagnostic group*

Autistic	Verbal Output (in words)	Normal
4	:0:	3
5,5	:0:	5,6,9
0,3	:1:	
	:1:	5
3	:2:	
	:2:	
	:3:	
	:3:	
	:4:	
	:4:	
	:5:	
	:5:	
1	:6:	

*Only those subjects who exhibited redundancies sufficient for inclusion in the second study are listed. The centre column lists verbal output clusters in units of 5 words. Peripheral columns list actual subject mean verbal outputs rounded to the nearest word, falling within the identified clusters. Numerals in the central column should be prefixed to those in the peripheral columns on the same horizontal line to determine the actual mean verbal output per subject. For example, the first subject in the autistic group had a rounded mean verbal output of 04 words per redundant response, while the last one exhibited a rounded mean verbal output of 61 words per redundant response.

Table 6 - Verbal efficiency in words across conditions by diagnostic group

Condition		Autistic		Normal	
Study 1 - Unprompted		Contrastive	Redundant*	Contrastive	Redundant
	M:	2.83	17.36	2.99	7.51
	SD:	.85	20.36	.84	4.41
	Range:	2.0 - 3.75	4.16 - 61.13	1.5 - 4.0	3.25 -14.63
	n =	5	7	9	5
Study 2					
Prompted					
	M:	7.0		3.98	
	SD:	6.04		1.19	
	Range:	3.40 - 20.50		2.60 - 5.30	
	n =	7		5	
Generalization:					
	M:	4.24		4.22	
	SD:	1.25		1.33	
	Range:	3.33 - 6.50		2.80 - 5.70	
	n =	6		5	

* Mean redundant responses are only reported in the unprompted condition as in subsequent phases they occurred too infrequently to analyze.

When the speech of all subjects was considered throughout the experimental tasks and coded for non-task related utterances, semi-task related utterances and "odd" features as previously described, several noteworthy differences were found. First of all, to assess equivalence of opportunity for the occurrence of such features the mean total number of utterances for each group was compared. Mean totals of 205.2 utterances for the group with autism and 161.56 for the control group were not significantly different (t (17.7) = 1.06, n.s.) Despite the absence of statistically significant differences in opportunity, it was felt that converting raw numbers of utterances into a proportion of the total number of utterances for each subject would be a fairer representation of the data and would facilitate group comparisons. For each subject, the total number of coded utterances across all of the categories listed was converted to a percentage of total utterances, as were the totals for each of the sub-categories. Mean percentages of total utterances classified in one or more of the of "odd" categories were 10.87% for the group with autism and .796% for the control group. These means were found to be statistically significant (t (18) = 2.98, $p < .01$). As shown in Table 7, when between groups differences were assessed on sub-types of odd responses significant differences were found between the means of the autistic (M = 2.45%) and the control (M = 0%) groups on the percentage of non-task related utterances (t (18) = 2.39, $p < .05$). Mean semi-task related utterances of 3.76% for the group with autism and .437% for the control group were also significant (t (18) = 2.428, $p < .05$) as were average "odd" utterances of 17.24% and .367% for the autistic and control groups respectively (t (18) = 2.48, $p < .05$).

These three significant differences must be interpreted with some caution due to the use of repeated t-tests and thus the enhanced possibility of Type 1 error. Nonetheless, an analysis of the number of subjects in each group who exhibited the unusual features, revealed significantly more autistic subjects (7 of the 10) who exhibited one or more utterances that were judged to be non-task related by the criteria listed previously. None of the normal control group subjects engaged in this. A Fisher's exact probability test yielded a probability of this occurring by chance of .0015. Similarly, when semi-task utterances were

considered, significantly more members of the autistic group (8 out of 10) displayed one or more of these compared to 3 of the 10 matched normal controls (Fisher's exact probability = .03). A Fisher's exact probability of .03 was also calculated for the chance occurrence of one or more utterances judged to be "odd", according to the criteria previously described, with 7 of the 10 autistic subjects exhibiting these compared to 2 of the 10 control subjects. Finally, significantly more (8 of the 10 versus none of the normal controls, Fisher's exact probability = .0003) of the autistic group displayed more than one category (e.g. non-task related and odd utterances) of these features judged to be indicative of qualitative difference in communication. Thus, not only did the autistic group demonstrate, on average, a greater number of unusual utterance features, but more of them also exhibited these oddities.

Table 7 - Percentage of utterances containing "unusual" features by diagnostic groups

Group		Non-task Related*	Semi-Task Related*	"Odd"**	Total**
Autistic:	M:	2.45	3.764	4.56	10.87
(n=10)	SD:	3.25	4.24	5.28	10.67
	Range:	0 - 8.95	0 - 13.4	0 - 17.24	0 - 31.03
Normal:	M:	0	.437	.367	.796
(n=10)	SD:	0	.82	.82	.988
	Range:	0	0 - 2.19	0 - 2.4	0 - 2.18

* Between-groups differences significant at .05 level of probability.

**Between-groups differences significant at .01 level of probability.

CHAPTER 5

Discussion

The current investigations examined the language disorder in autism through an area previously reported to be dysfunctional, that of presuppositional pragmatic competence. Within that general arena, the referential communication paradigm was specifically chosen for several reasons. First of all, links between the communication skill of referential communication and the cognitive skill of perspective taking had been successfully established in the normal population by Roberts & Patterson (1983). Examining the extent of the same relationship in autism afforded the opportunity of discussing the fundamental nature of the language deficit associated with autism. If the relationship between the two skills could be established as similar to that found in the normal population, then one avenue by which functioning in a specific cognitive skill exerted an impact on a particular type of communicative performance would have been established. While developmental domains are generally acknowledged to be reciprocally influential, specific,established pathways of such influence are rare.

Additionally, according to a recently proposed theoretical hypothesis (Baron-Cohen et al., 1985), social and communicative dysfunction in autism can be traced to a specific cognitive developmental deficit in metarepresentation or application of a "theory of mind". The connection between referential communication and perspective taking offers a unique opportunity to either support or discomfirm this hypothesis as the ability to assess an interlocutor's conceptual perspective, proposed under the "theory of mind" hypothesis to be specifically impaired in the autistic population, should lead directly to impairments in the ability to communicate a referent clearly, given the relationship posited by Roberts & Patterson (1983).

These issues were addressed through two studies. The first of these replicated Roberts & Patterson's work of 1983 using autistic and age matched and equivalent language level normally developing controls in an attempt to determine whether or not

referential communication and perspective taking skills were related in the autistic population in a manner similar to that found within normally developing children. The second study extended the investigation to determining whether or not improved performance could be elicited by application of a prompting paradigm, and subsequently whether or not this improved performance would generalize to novel stimuli. Improved performance, especially in the condition assessing appropriate transfer, was interpreted as evidence counter to the theory of mind hypothesis, suggesting not that the autistic speaker is lacking ability in attribution of mental states, but rather that they may not spontaneously use this skill. Additional analyses were directed to documenting communicative deficits that could not be readily attributed to the proposed deficit in theory of mind in order to further buttress this argument.

Results from each study are first considered separately. This is followed by a discussion of the implications of the findings from analyses conducted on spontaneous language obtained across both studies. At the outset, it is important to point out that these studies were conducted using very high functioning autistic subjects. While specifically chosen for their close to normal intelligence and their verbal skills in an attempt to ensure that any deficits would not be attributable to mental retardation, the use of this subset of autistic subjects has its price in terms of generalizability of results and representativeness of this sample to the population with autism. While acknowledging that these results cannot be widely generalized because they were obtained from such a specialized sample, its use was felt to be justified as attempts to isolate the specific deficit in autism must account for both the best and the worst in the population.

The purposes of the first study were to establish the relationship between referential communication skills and perspective taking ability within the autistic population, and to assess differences between autistic subjects and age matched and equivalent language level controls. Predictions included a similar relationship between the skills, but depressed performance in both tasks in the autistic group relative to the

controls. Contrary to expectations, questions about the relationship between the two skills in the autistic population could not be definitively answered because most subjects performed at or near ceiling on the perspective taking task. Some suggestion of the hypothesized relationship between the skills may be taken from data of two of the three unmatched lower functioning autistic subjects who demonstrated substantial difficulty in adequate perspective taking responses, and who also exhibited "uninformative" responses on the referential communication task. Thus, when a person experienced great difficulty with perspective taking, (s)he also displayed significant problems with referential communication. While the results of the unmatched group provide an interesting counterpoint to those of the matched subjects, because there were so few of them and they were not matched to equivalent language level controls, their data are insufficient to draw reliable conclusions about the nature of the relationship between referential communication and perspective taking in the autistic population.

One interesting finding from the data collected in Study One is the number of autistic subjects who would be classified as "redundant" speakers (on the basis of the majority of their responses on the referential communication task being "redundant" versus "contrastive" or "uninformative"). In Roberts & Patterson's (1983) work with normally developing children, very few were classified as redundant and of those, the majority had been involved in the second task order (i.e. perspective taking task administered first, followed by the referential communication measure) which seemed to predispose toward redundant performance in referential communication. In the present study, 7 of the 10 matched autistic subjects and 5 of 10 matched controls were classified as redundant. As previously discussed, this was not attributable to learning effects associated with task order. In fact, the trend in the current investigation, if any, was toward more contrastive responses in task order two. One possible explanation of any influence toward better performance on the referential communication measure in task order two is that they were exposed first to a task in which the examiner took considerable control and

where expectations placed on the subject were primarily ones of recognition versus construction of the appropriate response (i.e. recognizing the correct option in the perspective taking task followed by generating a description in the referential communication task). This may have allowed subjects to relax in the experimental situation and become comfortable with the general parameters of the task before being required to build sentences for the listener. If so, this serves to reinforce the argument that the skills required to perform optimally are not missing from the repertoire of the autistic child, but that they will emerge under some conditions.

Additionally, in the Roberts & Patterson study (1983), subjects who were categorized as "redundant" varied considerably in their performance on the perspective taking task. This was not found in the current investigation. Of the eight (seven matched, one unmatched) autistic subjects who would be classified as "redundant" speakers, six (all matched) were judged to have "passed" the perspective taking measure (i.e. achieved a score of six or more of a total possible eight). Of the five "redundant" control group speakers, all attained perfect scores on the perspective taking evaluation. One possible explanation here is that the notion of efficiency in communication as the criterion governing optimal performance in the referential communication measure may not have been immediately apparent. In fact, explanations in real world, unstructured situations are often full of redundancies and repetition of common elements is sometimes a valued activity. Some support for this notion is garnered from an examination of the results in the prompted and generalization conditions and will be discussed in more depth there. In brief though, the rapid shift in control group performance to "contrastive" responses in the referential communication task may attest to the fact that even the most minimal prompt served as notice that efficiency was the valued criterion in the experimental si_ ntion. The fact that the same shift occurred in the autistic population, though not as rapidly or completely, again reinforces the notion that any difficulties exhibited in this domain stem less from an absolute incapacity to perform the task as from difficulties in

judging appropriate instances in which to apply skills that already exist within their repertoire.

Also contrary to expectations, there were no statistically significant group differences in performance on the experimental referential communication or perspective taking tasks. Possible explanations for the unexpected high performance levels in the autistic group may rest in the sample chosen. Perhaps these subjects were too competent mentally, too old, or the task simply too easy. Younger children, who had not had the same opportunity to gain coping skills through life experience, or more mentally handicapped subjects might have demonstrated the predicted results. Unfortunately, while such subjects were sought, they were not available. However, the issue does not appear to be that simple. Turning again to an examination of the data on the three unmatched autistic subjects, not all of the unmatched group were younger. In fact the two demonstrating the most difficulty on both tasks were aged 18 and 25 years. All of the unmatched group had verbal IQ scores in the 70 to 79 range, yet one of these exhibited perfect performance on the experimental tasks in contrast to some of the higher functioning subjects in the matched groups. Thus, mental or chronological age does not appear to be a sure indicator of task difficulty.

Another alternative to investigate group differences would be to use more difficult tasks. As Baron-Cohen (1989b) demonstrated, some higher functioning autistic subjects were able to succeed on the lower level perspective taking skills, but showed deficits relative to mentally handicapped controls when they were required to make more sophisticated judgements. Perhaps both group differences and the nature of the within group relationship would be revealed if the subjects were presented with more challenging requirements. Definitive conclusions about the relationship between referential communication and perspective taking in autism must await a study in which greater task discrimination occurs so that subjects do not perform at ceiling levels.

In the larger theoretical context, one might argue that successful performance on these tasks is not indicative of ability to assess a listener's state of knowledge and thus that these data are irrelevant to a discussion about whether or not autism's social and communicative dysfunction can or cannot be attributed to deficiencies in development of a "theory of mind". At first glance, it appears that optimal performance could be achieved on the referential communication task by ignoring the stated instructions and simply telling the examiner, on the basis of the stimulus card placed in front of the subject, which attribute distinguished the two potential referents on the card. In short, a subject could conceivably ignore the "listener" entirely and perform successfully by interpreting the referential communication task as if it were the comparison task. One counter argument to this proposal rests on the differential performance between the comparison task and the referential communication measure. If subjects were interpreting the referential communication task as simply another way of requiring a comparison, performance on the referential communication measure should have been equivalent to that on the comparison task. This was not true in any of the groups. Comparison task performance was consistently perfect across all subjects whereas referential communication performance varied. While it might have been possible that comparison task scores were inflated by the effect of practice, Roberts & Patterson (1983) showed that there was no evidence of practice effects artificially elevating comparison task scores in their work. Testing an independent group on the comparison task alone revealed similar scores to those found in their experimental subjects. Therefore, the comparison and referential communication tasks appeared to have been interpreted as independent measures. Because the current investigations were modelled on the Roberts & Patterson paradigm, the same judgement is applied here.

Adjustments to the experimental paradigm that might alleviate concerns about whether or not these particular experimental tasks actually require the subject to be mindful of the "listener" and their perceptions might include the following:

(1) Changing the elementary perspective screening measure by adding some items in which the "listener" does know the target referent. Here, the appropriate response to screening queries such as "Does (s)he know which one the secret one is?" would be "yes" and the investigator would have evidence to indicate that the subject was not simply following an "odd man out" strategy in giving appropriate responses to the real experimental items where the "listener" did not have access to which of the two figures was the target referent.

(2) Changing the instructions on the experimental tasks to include some messages to be communicated to the examiner or to an unseen other. If responses varied in accordance with the status of knowledge of the communicative partner (e.g. saying to the examiner "It's right here" vs. a message of "It's the red one" in a message to the listener in the experimental situation), one would have some additional evidence that the interlocutor's perceived state of knowledge was influential in shaping the subject's response.

While these adjustments might be helpful in establishing whether or not the role of the "listener" was appreciated and considered in the interaction, their usefulness depends upon the spontaneous occurrence of differential responses on the part of the subject. Particularly in the second case, subject responses might be perfectly appropriate but still undifferentiated with respect to the listener. In that event, the experimenter would have no additional data leading to a clear conclusion about whether or not the participant was assessing the communicative partner's state of knowledge. In addition, such adjustments to the experimental method would considerably increase the artificiality and complexity of the experimental situation and thus may not be worth any benefit that might accrue.

In the current study, additional and more conclusive evidence against the claim that subjects were ignoring the listener and responding solely on the basis of the stimulus card placed before them comes from spontaneous comments in 8 of the 10 matched

autistic subjects specifically referencing the listener. Statements such as "Okay [name of listener], there are two shapes on the page", "So, then she goes for the lowest dot, obviously", and "I told her the secret one" clearly indicate that subjects were aware of the role of the listener and considering the nature of the message that would need to be given in order to make the communication clear for that person. Similar comments were noted in the perspective evaluation task. Examples such as "That'll tell him", and "Oops, almost gave it away that time" show that participants were focussing on the listener and what the listener did and did not know. Of the two subjects from whom such spontaneous comments were not recorded, a re-examination of the videotapes showed postural orientation and eye contact directed to the listener rather than the examiner indicating that the task was successful in setting up the situation to assess the desired response. Thus, at least in the current investigation, it seems reasonable to conclude that participants were proceeding as the situation was designed and were responding with the listener's needs in mind.

Therefore, despite concerns raised about the near ceiling level performance of the autistic group, results from Study One indicated that there is at least some subset of the autistic population that is generally able to referentially communicate and able to assess another's conceptual perspective at a relatively sophisticated level. In order to succeed at the perspective taking task, subjects should have not only understood that they as speakers possessed some information of which the listener was unaware, but also what specific information was missing from the listener's perspective. Whatever the relationship between perspective taking and referential communication, insofar as perspective taking represents the ability to posit a "theory of mind", deficits in this ability were not responsible for errors in referential communication. The matched autistic subjects consistently performed well on the perspective taking task, but were not always similarly successful in referential communication. In short, perspective taking ability may be necessary for successful referential communication but does not appear to be

sufficient. In the broadest context, this suggests that a specific developmental deficit in the cognitive skills associated with developing a "theory of mind", is unlikely to be fundamentally responsible for the communicative deficits associated with autism.

Study Two was composed of two conditions: one called prompted and one labelled generalization. The purpose of this study was to determine whether or not improved performance could be elicited by the application of a prompting paradigm, and secondly, to ascertain whether or not this improved performance would generalize to novel stimuli. Consistent with Boucher's findings (1989), that autistic subjects could sometimes demonstrate skills that they did not spontaneously exhibit, it was predicted that administration of a prompt would facilitate better performance and that this improved performance would successfully generalize to novel stimuli. These predictions were upheld.

In the matched groups, those who proceeded to the second study all improved in referential communication task performance in the prompted condition. Performance on the perspective taking task was usually so high that no prompts were required at any stage. Because scores in the prompted condition were taken following the administration of a very directive prompt, with success achieved by following very simple instructions, improved performance here, while consistent with the predicted results, is less than totally convincing in terms of providing evidence of an underused skill versus a specific developmental disability. It is possible that subjects could have attained optimal performance by simply following the examiner's directive rather than by generating a response utilizing their own cognitive and communication skills. Vygotsky's (1962) notion of a "zone of proximal development" where emerging skills are elicited by means of a prompt or an intervention procedure provides an additional alternative explanation. In any case, the rapid demonstration of desired behaviour suggests that the skill being demonstrated is not totally foreign or out of the developmental scope of the participant but rather that it is already present, at least in some form.

Initially, inclusion of any of the normal control subjects in the second study had not been expected because they were expected to be optimally proficient at the experimental tasks on first exposure. However, 5 of the 10 qualified to proceed to Study Two. Of these only two required any prompting, and that prompting was minimal, in order to boost their scores to optimal levels. Perfect performance levels were then consistently maintained in this group on all subsequent trials in both prompted and generalization conditions. As previously mentioned, the prompt may have served to alert these subjects to the dimension of communicative efficiency as the criterion for valued or optimal performance.

Significantly more prompts were required in the seven subjects of the matched autistic group who qualified for admission to the second study. The differential number of prompts required for each group was highly significant. This finding suggests that despite the similarity in average score between the groups, some autistic subjects appeared to be less flexible at utilizing the clues given regarding performance expectations than the normal control subjects. Suggestions relating to inflexibility of response in the autistic population were previously noted by Paul & Cohen (1984 ; 1985) and Wetherby & Prutting (1984). One possible explanation here is found in Vygotsky's framework (1962). It is possible that for this aspect of development, the autistic subjects still rely , to some degree, on external cues and control in order to respond appropriately, whereas the more internally controlled normally developing subjects utilized even minimal cues to optimal response immediately and effectively. Still, in a previous study, some of these same autistic speakers were also shown to be creative in generating lexical items, often in logical and meaningful, if unconventional ways (Volden & Lord, 1991), demonstrating that flexibility and internal control are not entirely lacking within this segment of the population . These imbalances stand as one example of the asynchronous development posited by Tager-Flusberg (1989).

Consideration of the generalization condition revealed that the matched autistic subjects maintained improved task performance when exposed to novel stimuli. Despite some regression from the near perfect performance levels noted in the prompted condition, their performance on the referential communication task was significantly improved from the initial unprompted exposure. It might be argued that the effects of practice were responsible for the improved performance demonstrated in the generalization condition. If so, some support is still lent to the notion that the skills must have been already present, at least to some degree, if the limited practice involved in these experimental conditions was sufficient to produce consistently improved optimal responding to novel stimuli.

While Loveland et al. (1989) also found referential communication ability to be improved following the administration of increasingly specific prompts, they suggested that this was due to a removal of perspective taking demands from the burden placed on the autistic subjects. In the current study, however, perspective taking scores were consistently high indicating that requirements to assume another's conceptual viewpoint did not pose a significant burden for these subjects. Still, one might argue that the prompt, composed of a directive to compare the two stimuli and then to tell the listener what the difference was, constituted removing the need for the speaker to take the listener's perspective. The data from the generalization task speak to this issue. No prompts were given in this condition, yet improved referential communication performance was largely maintained. If the autistic speaker was merely relying on the experimenter's directions in order to compose and communicate an adequate message, scores on the referential communication task within the generalization condition should have returned to the levels noted in study 1. Instead, once cued, autistic speakers were able to maintain improved performance when faced with novel stimuli in the absence of prompt support. This finding suggests that improved scores may be due to an understanding that use of perspective taking ability might be helpful in fulfilling the

demands of the referential communication task. Autistic speakers who demonstrate the ability to assess another person's conceptual viewpoint may not spontaneously apply that knowledge in the solution of another problem.

Some recent support for this notion comes from Loveland & Tunali (1991). Their study of the responses of autistic and Down's syndrome speakers within a staged situation employing a social script (i.e. a scenario that would generally elicit a predictable reaction) showed that in some cases, autistic subjects understood the need to respond in a specific social situation but appeared unable to do so until given a model. Once a model was obtained, they seemed able to gain access to appropriate skills. Instead of just echoing or imitating the adult's model, they generated novel but still appropriate utterances to the situation. This indicates an ability to perform once the conditions for success have been outlined, but suggests at the same time, some difficulty in spontaneously connecting one skill with another. Instead of demonstrating a developmental incapacity, they may be having difficulty in flexibly interconnecting and applying available skills. Once directed to apply that knowledge, at least some autistic speakers can do so. While research indicating concerns about autistic speakers as experiencing difficulty in gaining access to appropriate skills versus operating with a deficient skill repertoire is still in its infancy, it represents exciting possibilities for intervention with the autistic population. If research is able to show that skills are often present but underutilized, then whole new avenues of therapeutic management will be opened.

While these data are supportive of the notion that skills might be available but underused, the reader is cautioned that, in the current study, the generalization task was identical to the previous measures and the stimuli used in it were only superficially different from those employed in the previous conditions. In short, the task employed was a "near" generalization task. Stronger evidence of a fully established transfer to active problem solving of a previously underused strategy would result if the same results

were obtained with tasks that were further removed from the original (sometimes called a "far" generalization measure) and if improved performance were maintained over time. These conditions were beyond the scope of the current investigations.

Overall, the results of Study Two showed that, in this select sample, efficient referential communication could be elicited in those autistic speakers who initially made redundant responses. The fact that improvements were substantially maintained in the generalization condition indicates that facility in referential communication transferred to a new situation where prompts were not administered. This has been interpreted to indicate that requisite abilities for successful performance were previously present but possibly not applied.

In terms of the theoretical hypothesis under examination, even if these subjects would still display theory of mind deficits when assessed at a higher level (as suggested by Baron-Cohen, 1989b), it is unlikely that such deficits are at the root of communicative deficits found in this subset of the population. If cognitive higher level deficits were responsible for the referential communication errors noted in the first condition, then prompting consisting of an injunction to apply comparison and perspective taking abilities which were consistently demonstrated to be within the subject's repertoire should have had no effect. Certainly, an improved performance level should not have been maintained.

Despite mean scores on experimental tasks that were similar to the control group, the autistic group also displayed several linguistic peculiarities that marked their communicative interactions as qualitatively different from their age matched and equivalent language level peers. When errors of redundancy were displayed in referential communication performance, a greater number of autistic subjects were more redundant in terms of the number of attributes included in their descriptions. While errors of redundancy might be explained by the theory of mind hypothesis (i.e. without knowing what information the listener had or had not, the subject might choose to describe

everything on the stimulus card), it does not in turn account for the improved efficiency of response noted in the prompted condition and maintained in the generalization phase.

Several unusual aspects of discourse management were also exhibited. As indicated previously, the origins of appropriate conversational management are believed to be within the earliest interactions between infant and caregiver. The evidence for autism's communicative dysfunction beginning in the preverbal period, before one would expect any development of metarepresentational capacity, has already been presented. In addition, it is difficult to conceive of how a difficulty in appreciating a listener's conceptual state, especially at the sophisticated levels not tested in this study where such a deficit would have to reside in this population, could be responsible for the generation of off-task comments of the type observed.

While there were no significant differences in the total number of utterances between the groups, there were substantial differences in the occurrence of a variety of inappropriate utterances. Because these interactions were quite structured, samples on which these observations were made are not large. However, the differences found may be more noteworthy because of the structured nature of these interactions. If significant differences are found in interactional flow within a structured context where autistic subjects are said to function most appropriately (Paul & Cohen, 1985), one speculates that in an environment that was not so tightly controlled, these disturbances would be exacerbated.

Not only did the autistic subjects interrupt the flow of the interaction more often with off task statements, but the occurrence of these was also more consistent across the members of the autistic as opposed to the control group. Particularly noteworthy here were statements classified as "non-task related" such as "Did you know that a zebra is almost like a horse?" exhibited by 7 of the 10 matched autistic subjects. None of the control group subjects displayed these behaviours. As the only possible association to a zebra was the presence of striped stimuli, statements of this type were particularly jarring

in the perceptions of the principal investigator and the adult listener(s) who participated in this project. Judging from our reactions, such comments may be especially salient in contributing to a listener's judgment of the autistic speaker as inappropriate. Future research should be directed to an examination of such behaviour in comparison to the expressive language of much younger children to determine if this interactional pattern is found in the conversations of normally developing children at any stage. It is possible that this might be another example of asynchronous development where sophisticated syntactic and vocabulary skills are combined with very immature pragmatic ones. When juxtaposed in conversation, they are judged as very atypical and possibly overly sensitize the listener to the occurrence of any subsequent unusual utterances

Utterances categorized as "semi-task related", i.e. not relevant to the successful completion of the task at hand, but somehow related to the notion of the task, were expressed by members of both groups. The groups were significantly different both in terms of the average number of these exhibited as well as the number of members in a group who displayed them. Finer grained analyses of larger samples may reveal qualitative differences between autistic speaker's utterances of this type and those of equivalent language level controls. For example, statements classified in this category from the normal subjects were always clearly related to the task being presented, even if irrelevant to its successful completion e.g "You're changing the order [of presentation] now, tricky", or "It's been a long day", in reference to a slip of the tongue which the subject immediately corrected. While some of the utterances offered by the autistic group were very similar ("Boy, those yellow ones are hard on the eyes"), many were more obliquely related (e.g. "Then, that means I'm on top of my day" referring to the fact that the subject perceived that he was answering questions accurately). In addition, statements of this class generated by normal subjects were invariably accompanied by some verbal (e.g. "I'm teasing.") or nonverbal (e.g. a smile, intonation expressing sarcasm) expression of humour while those of the autistic group were not marked in this way. While the current

samples are too limited to draw any reliable conclusions, more detailed analyses of such utterances in larger samples collected across a variety of contexts may prove useful in clearly delineating the elements of expression that serve to set the autistic speaker apart from more competent communicators.

The third type of flagged utterance was labelled "odd" or "idiosyncratic". Specific criteria for this code have already been outlined. While less specifically discourse related, these data were included as a means to document unusual language features that appeared odd in some way but did not fit within the previous two categories. In the current investigation, utterances that were [illegible]ernally unusual, or task-related but socially inappropriate (such as pedantic or inap[illegible]ly directive utterances) were included in this group. Again, more of these were p[illegible]n the autistic population than in normally developing controls and more members [illegible]hibited one or more of these utterances than matched controls.

Finally, more members of the autistic group exhibited more than one of the three types of unusual utterances in contrast to the control group subjects. For example, 8 of the 10 matched autistic subjects exhibited, within the limited sample obtained, both "non-task related" and "odd" utterances, or "semi-task related" and "odd" utterances, or "non-task" and "semi-task" related statements whereas none of the control group subjects did so. This suggests that the language dysfunction in autism will be manifest in several areas and that isolated examination of one (e.g. discourse management or internally inconsistent statements) may not yield a true picture of the total communicative dysfunction that results in high social penalties for the autistic speaker. In addition, the variability noted in the language samples obtained suggests that consideration of individual profiles of language may be particularly fruitful in establishing the idiosyncratic characteristics of particular autistic speakers that serve to set them apart from the mainstream.

While these results must be regarded as preliminary, they raise a host of fascinating issues for future research. For example, are some types of pragmatically inappropriate utterances more salient than others in engendering a listener perception of inappropriateness or incompetence? Alternatively, is a linguistic profile including a variety of odd utterances more influential in listener judgments? Is frequency with which unusual utterances occur a factor in perceptions of the autistic communicator as atypical? What influence does situational context have on both the autistic speaker's use of such statements and the listener's assessment of their effects? What is the relative influence of syntactic, semantic and pragmatic errors in affecting listener perception? And finally, when inappropriate patterns are identified, can they be replaced with more functional practices?

Because these qualitative communicative differences are shown in even the highest functioning autistic subjects, more intensive examination of them may also prove useful in determining the profile of communicative behaviour that is specific to the phenomenon of autism. Unfortunately, the samples obtained through these studies are too small for any reliable conclusions to be drawn. Still, their significantly greater occurrence in the autistic population as compared to age matched and equivalent language level normal controls attests to the presence of communicative dysfunction in autism beyond what can reasonably be attributed to simple developmental delay. While their origins may still be developmental, the profiles demonstrated seem to be better accounted for as an example of asynchronous development than of generally depressed skills. Further, their presence in the face of intact, relatively sophisticated perspective taking skills suggests that factors other than a specific cognitive deficiency in development of a theory of mind must be at least partially responsible for the language disturbance in autistic speakers.

In summary, the current investigations were undertaken first, to establish the nature of the relationship between referential communication skill and the ability to assess

and assume another person's conceptual viewpoint. The second purpose was to determine whether anticipated performance difficulties could be ameliorated by application of a brief, but directive, prompt and subsequently whether improved performance would generalize to a similar situation employing novel stimuli. Together these data were used to comment on the recently proposed "theory of mind" hypothesis as the root of autism's social and communicative dysfunction. A secondary purpose was to examine qualitative differences that emerge in the spontaneous language of autistic speakers and that could not easily be accounted for by a specific cognitive deficit in metarepresentation.

A definitive relationship between referential communication and perspective taking skills could not be established due to unexpectedly high performance on the perspective taking task within the autistic group. Significantly improved performance occurred following administration of the prompt and was maintained in the generalization condition. Taken as a whole, these results suggest that difficulties in referential communication, and thus in the expression of presuppositional pragmatic competence, may not be fundamentally accounted for by disturbances in the autistic speaker's development of a "theory of mind". In addition, given at least relatively intact perspective taking skill, the autistic speakers still displayed significant difficulties in a variety of pragmatic, syntactic and semantic language behaviours. Their presence serves to buttress the argument against a developmental deficiency in metarepresentation as the primary source of autism's communicative dysfunction.

The current investigations stand as preliminary efforts to examine the referential communication skills, and through them, the presuppositional pragmatic competence of autistic speakers. Further research with younger and/or more mentally handicapped autistic children will be needed to substantiate the suggestions outlined here. In addition, an examination of the discourse abnormalities evidenced in the spontaneous speech of autistic speakers may yield important results that would both suggest new

avenues for isolating the fundamental deficit that is specific to autism as well as new directions for remediation that would support the functional integration of members of this population into society at large.

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Appendix A

Sample Transcript of Autistic subject from Study One

J: OK, So, as you can see, these are fairly ... these are just sort of some practice ones to start with... What colour is that, T.?

T: It's yellow.

J: Good! And this one, what colour is that?

T: Red.

J: Uh-huh and what shape is this?

T: Triangle.

J: Very nice! and what shape is that one?

T: Circle.

J: Good for you - And what - Oops, sorry about this table - What are those inside there?

T: Stripes - pointing vertically.

J: And these?

T: Dots - scattered at random.

J: Uh-huh! And where is the black dot in this one?

T: The black dot, in the picture with the triangle - is pointing to the north. The black dot, in the picture with the circle, is pointing to the south.

J: OK - and if we think of another way to think about this - would you say it's at the top or the bottom - in this one?

T: At the bottom in this picture and at the top in this picture.

J: OK - very nice. Now, we're going to do some a little bit differently.

T: So - on to the real test.

J: On to the real test, yeah.

T: OK.

J: Easy stuff over. Um - let me just see here.

T: As long as I don't get too technical.

J: Well, you just do what you think is best. OK? Okay, I'm going to put this card here...

T: Uh-huh.

J: and this one that is just like it:..

T: uh-huh.

J: Im gonna put over here for her to look at. OK?

T: 'Kay.

J: Now, I'm gonna move this thing - she can't see this..

T: Uh-huh

J: And I'm gonna put this beside one of these...

T: Uh-huh.

J: And when I do ...

T: Uh-huh.

J: The one that it's beside will be the secret one.

T: Uh-huh.

J: Okay? Now, let me just make sure I know which one I want to be the secret one - this one, okay?Now - so that one's the secret one. Now - do I know which one is the secret one?

T: Sharon doesn't, but you do and I do.

J: Okay, okay, now then, what I want you to do is for you tell her - now - which one is the secret one so she can pick it out on her card. You tell her which one we've marked so that she could pick it out.

T: OK - Sharon - There are two shapes on the page. And on the left side of the page, there is a triangle. On the right, there is a circle. And on, the angled side of the traingle which is facing left, just slightly above the apex -is where the red marker is.

J: OK - Alright, that's good T. Now, if I were to put this here instead and you had to describe which figure - which one of these two was the secret one - and so it you weren't describing where the marker was precisely, but you were describing which one of the figures, this one or this one (pointing) , was then, was the secret one, how would you describe that?

T: The secret spot is in the triangle to the left about one centimeter from the black dot at an angle.

J: OK - Now, then if I were to stop ... to take that marker away and just....

T: Joanne?

J: Uh-huh?

T: Uh- not that there's anything against this, but, uh, do you think that sometime we might just take a break and get some water?

J: Sure.

T: It is - the room is kind --just wondering

J: Sure, anytime ...Um... do you want to do a few and then take a small break and get water.

T: Sure - like I mean, like, maybe it'd be best for all of us, if you could say just get a jug and some cups.

J: Yeah, I don't know whether we can, actually - there is just a water fountain down the hall - but maybe next time I'll be able to be more prepared and get a jug..

T: OK

J: ...but certainly we can take breaks for drinks of water, if you like.

T: OK, I think in a room like this it might be an idea.

J: Yeah. OK (returning to task) If I were not to put the red marker in, but just to ask you to describe whether it was this particular shape, or this particular shpae... well- this particular figure or this particular figure that was the secret one.. without describing where the marker was, how would you describe this one to her.

T: I would describe it as a unilateral traingle with a black dot running straight along the point, from the apex to the centre of the base, lined with horiz- vertical stripes.

J: OK - That's fine, T.

T: OK - I guess you're kinda meant to stumble a bit on this, aren't you?

J: Oh sure, yeah, I mean, there will be - it can't be very fast because of course you have go stop and think a little bit about it and so don't worry at all if you, if you need to take...

T: That is the purpose of the test.

J: Yep.. that's part of the purpose of the test. OK - so we're gonna do basically the same thing again.

T: OK

J: I'm gonna put this one here for you to look at...

T: Uh-huh

J: This one which is exactly the same ...

T: Uh-huh

J: ...over here and we're gonna put a marker - now remember, its important to describe the figure that the marker is <u>beside</u> rather than where the marker is.

J: OK. This one, this marker is just to indicate that this is the one that you should be describing - OK - So don't worry about describing where the marker is ... . just think about describing this one. 'Kay?

J: (cont.) Now let's just make sure we get this straight. This is the secret one.

T: Uh-huh.

J: Does Sharon know what the secret one is ?

T: No.

J: Right. Do I know?

T: You do, and I do.

J: Right, okay. Now you can tell her. Tell her which is- which one of those two is the secret one.

T: There are two triangles on the piece of paper, both outlined in red and both with red dots scattered within. There is one triangle at which there is a dot at the base - in the centre of the base of the traingle. The other triangle has a black dot at the apex of this triangle. The one with a black dot at the apex of its triangle is the one which is marked.

J: OK. I'll just put these away - now you've got it. I mean that's essentially what we're doing for this whole first set of cards.

T: OK

J: You don't have any questions about what you're supposed to do - is that pretty clear?

T: Do you mind it we maybe - at least if I get a drink just for me.

J: Sure, no problem, do you want me to show you where the water is?

T: Sure.

[Break for water]

J: Same think again. This card in front of you - one exactly the same in front of Sharon - with this one being the secret one. Now, just to make sure - Do I know which is the secret?

T: (Nods)

J: Does she? (pointing at listener)

T: Sharon doesn't.

J: But you do.

T: (Nods)

J: Right. OK, so go ahead and tell her which one is the secret one.

T: There are two triangles, each of them have a black dot at the apex. One of them is outlined in red with red dots scattered at random across it. The other triangle is the same pattern, except it is yellow. The yellow triangle is the one which is the mystery triangle.

J: OK - same thing again. Different cards. That one in front of you, this one just the same - Oops- thrown at Sharon.

T: (Giggles)

J: OK - this one is the secret one. You tell her which one it is.

T: There are two triangles. At the - centred at the bases of each of these triangles is a black dot. Both of these triangles are red, but the pattern is different. The one on the left is striped, with vertical stripes. The one on the right has dots scattered across it. The one with the dots scattered across it, on the right, is the mystery triangle.

Be interesting to see how K. does on this.

J: Um, it will be. Okay, there we are again, this one exactly the same in from of Sharon - and this one is the secret one. You go ahead and tell her which one it is.

T: There are two circles on the card. Both of them are red and both of them have vertical stripes, going down. One of these circles has a dot - has a dot at the north edge. The other circle has a dot at the south edge. The one with the dot, at the south, or down edge is the one which is the mystery shape.

J: OK, now actually I did just have an idea that I hope won't be too disruptive but I'd like to have you two change places actually because I can see Sharon on the video better than I can see you and you're the most important one so I'd like to see you

T: OK

J: So I'll have you switch around if that's not too inconvenient. Sorry guys. That's better. OK - same thing, just different focus-

T: Alright

J: - here we go. This one in front of you..

T: Uh-huh

J: ...this one exactly the same in front of Sharon..

T: uh-huh - and Sharon doesn't know but you do and I do.

J: Right and here we go - and just make sure I've got this right. Yep. This one. This one here is the secret one and you can go ahead and tell her.

T: There are two yellow circles on the page. The one on the right is yellow and scored with vertical stripes, the one on the left is also yellow but marked with a random pattern. Both of these circles have a black dot on the south end of the circles but the one with the yellow dots scattered across the surface is the one which is the mystery shape.

J: Okay. Can just leave this right there - put these guys away. And same thing again. This one for you - this one exactly the same in front of Sharon and this one is the secret one.

T: There are two circles on the page. Both of them have vertical stripes down them and both of them have a black dot centred at the south end. The difference is colour. The one on the

right is scored with red stripes, the one on the left with yellow. The circle on the left side is the mystery shape.

J: 'Kay. And - here we go - this one is front of you, this one exactly the same in front of Sharon and this one is the secret one. Okay.

T: There are two shapes on this card. Both of them are red, both of them have vertical stripes going down them and both of them have small black dot on the south end - on the south end. The difference is shape. The triangle which is situated on the right is the mystery shape.

J: 'Kay. Only a couple more of these and then we'll be done with this section.

T: Do you think a repeat will be necessary?

J: Um- I really can't tell just yet, but I will know at the very end.

T: Oh.

J: Here's that one for you. This one for her. This one is the secret one. You go ahead.

T: There are two unilateral triangles situated on this card. Both of them are yellow and both of them have yellow dots scattered at random across their surfaces. The triangle on the left has a black dot situated at the center of its base, but the triangle on the right has a black dot situated at its apex and this is the mystery shape.

J: I can see why a person would need a drink of water after describing these.

T: Well, they do it in court all the time.

J: Yeah, have you been to court?

T: Uh, unfortuantely, yes I have. Ah - Tony, my brother has been in a fair bit of trouble and I've seen him in court. As well, ah - apparently ah well - Joanne are you aware of fetal alcohol syndrome?

J: A bit.

T: OK, well, apparently, Tony has it.

J: Oh.

T: So, but anyhow, it's.. it is personal. I would really appreciate it if you would keep this confidential. And I guess in addition I've also taken Law 20 and 30 and I've also had a chance to participate in the mock trials.

J: Oh, I see.

T: Just as a witness, but you can kinda understand why if you've been going at it a long time, you need a drink.

J: Right. OK. Last one of these. This one in front of you. This one exactly the same in front of Sharon. This one is the secret one and you can tell her what it is.

T: There are two shapes on this page. They are both yellow and both are scattered at random with yellow dots. As well, both of these shapes have black dots on their south ends. The shape on the left- on the right- is a unilateral triangle, but the shape on the right - shape on the left - is a circle and the circle is the mystery shape.

J: OK. Last one of those. Now we can certainly take a short break here if you wanted to get another drink. Do You?

T: I'm okay - for now.

J: Well, we can stop in the middle too of the next set of - I mean, there are only - That's the first task, we call it, done. Um, and there will be two more to do. But in this next one I talk more than you do so maybe you won't get so dry.

T: Alright - you think this test will take about an hour?

J: Well, yeah - it shouldn't take any more than that - I don't think - it may not even take that long.

T: What time do you have because I have 2:30.

J: Oh, I have 1:30.

T: Oh.

J: (to Sharon) Do you have 1:30 as well?

S: Yeah, I have 1:30.

J: So, I think that...

T: Oh, must have read it wrong - Alright...

J: So I think we'll certainly be done by 2:00 or 2:30. But I think probably by 2:00. OK. Now this one is just a little bit different...

T: Uh-huh

J: ...Tara. The basic set up is pretty much the same. I'm going to put a card in front of you, and a card in front of Sharon ...

T: Uh - huh

J: These cards will be exactly the same.

T: Uh-huh

J: See that.

T: Uh-huh

Excuse...

J: I'm going to ...Uh-hum

T: I'm sorry, you say there are three tasks.

J: Uh hum - three altogether. This one is the second.

T: Alright.

J: Okay, now, I'm still gonna put one - a marker beside the secret one. And in this case, it'll be right here.

T: Uh-huh.

J: But in this case, well and we'll just make sure we establish about who knows which is the secret - Do you know which is the secret one?

T: Yes.

J: Do I know?

T: Uh hum.

J: Does Sharon know?

T: No.

J: No. Okay. But in this case, I'm going to give her a hint, or a series of hints, and I want you to judge whether or not the hint that I give her is sufficient for her to pick it out from her card or whether it's insufficient.

J: (cont.) So for example, if I give her a hint like "The dot's on the top". Is that enough of a hint? Could she pick out the secret one on her card from a hint like "The dot's on the top".

T: She could.

J: OK. That's exactly right. Now let's try another one. So that's how this task goes. I'm going to give hints and going to ask you whether or not the hint that I gave is sufficient for her to pick it out. Okay? So, here's a card for you

The remainder to task two consists of the examiner giving the hints listed according to the scoring protocol and T. responding with "sufficient" or "insufficient" following each hint.

Task three - Comparison

J: Ok, in this one, all we're looking for is for you to tell me how one looks different from the other. So in this case - I want you to tell me how this one looks different from that one.

T: The main difference is colour. The one on the left is red, the one on the right is yellow.

J: OK.

T: You don't mind if I do that (picking up cards and handing to J).

J: Oh, of course not, that's fine.

T: You mentioned the cards were slippery.

J: Right.

T: Sharon's not getting a card.

J: No, no just you this time.

T: Oh.

J: Okay. Thiis time I want you to tell me the difference between these two How does this one look different from this one?

T: The one on the left is a unilateral triangle. The one on the left is a circle.

J: And the same thing here.

T: The one on the left is scored with dots. The one on the right has vertical stripes.

J: And here...

T: The one on the left has a black dot at the apex of the triangle. The one on the right has a black dot centred along the base of the triangle.

J: Okay. Same thing again.

T: The one on the right is red, the one on the left is yellow.

J: 'Kay, and the same thing again.

T: Again, colour - the one on the left is red, the one on the right is yellow.

J: Okay, alright.

T: Even just talking about that woman, gives me ..

J: Well..

T: I know I should try to forget it but still...

J: Well, we just won't talk about it anymore here, so maybe that will help you relax a bit.

And this one?...

T: The one on the left is scored with vertical stripes, the one on the left is scored with random dots.

J: 'Kay, and the difference between these two?

T: The one on the left is an equilateral triangle, the one on the right is a circle.

J: And there?

T: The one on the left has a black dot facing to the south, the one on the right has a black dot facing to the north.

J: And here?

T: The one on the left is a unilateral triangle, the one on the right is a circle.

J: Very nice, T..

Appendix B

Sample coded "unusual" utterances by speaker within diagnostic group

Speaker within diagnosis		Non-Task Related	Semi-Task Related	Odd
Autistic				
P. D.	"Feel like I'm a baseball player who just hit his first major league home run."	x		
	"This is better than the tests I took in what was it Grade Two or something."		x	
	"The one on the right here has dots, the one on the left has been cut" (referring to the stripes).			x
S. J.	"That's my favourite colour."	x		

		Non-Task Related	Semi-Task Related	Odd
S. J. (cont.)				
	"It's dotted or horse spotted."	x		x
B. R.	"This is for Grade three."		x	
	"I just want to say 'dots enough'."		x	x
	"Has a dot up."			x
T. M.	"I would describe it as a unilateral triangle with a black dot running straight along the point, from the apex to the centre of the base, lined with vertical stripes."			x
	"I guess you're kinda meant to stumble on this aren't you?"		x	

		Non-Task Related	Semi-Task Related	Odd
T. M. (cont.)	"Be interesting to see how K. does on this!"		x	
	"Well, they do it in court all the time."	x		
K. S.	"God, those are hard on the eyes, those yellow ones."		x	
	"I remember bells from school."	x		
M. O.	"Well, if you just point at her I get the drift which is if you just simply point at it, then she wouldn't know"		x	x

	Non-Task Related	Semi-Task Related	Odd
M.O. (cont.)			
"Thing with being colour blind is you can't tell which one's yellow and which one's white."		x	
"I know if I can go around the bush or not, sometimes er		x	x
"Are you a student?" (to the listener)	x		
"Ah, yes. That made it more easier 'cause it made... I thought it was one line was straight and the other one's squiggly but I guess um, guess it's the inside one which gave away the most."		x	x

		Non-Task Related	Semi-Task Related	Odd
R. W.	"I'm tired from climbing all those stairs."	x		
	"Can't remember this in two day, because it's not a, 'cause I can't worry about doing this every time."		x	x
	"Do you realize a zebra's like a horse almost.. but you don't want to ride it."	x		
	"Is that all you have is triangle, circle?"		x	
	"I had no problems finding this building... It would be ridiculous if I pretended not to."	x		x
	"Mentally tired is when you're just tired of the work."	x		

		Non-Task Related	Semi-Task Related	Odd
M. K.	"It wouldn't really specify the circle, when you're saying it's just one set of clue."			x
	"I know that in two second"		x	x
Normal				
J. G.	"These tests make you feel good".		x	
	"Had me thinkin' there."		x	
C. M.	"Blue?" No, I'm teasing, it's yellow."			x
	"Not the striped one."			x

		Non-Task Related	Semi-Task Related	Odd
J. B.	"You're changing the order on that now."		x	
	"I don't envy the person who had to make these cards up."		x	
R. F.	"It's been a long day" (referring to a mistake which he immediately self-corrected)		x	